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On a Collection of Snakes from Bengamisa, Right Bank of the Congo River, Northeastern Democratic Republic of the Congo

Olivier S. G. Pauwels [1] and Marc Colyn [2]

Abstract

We present a collection of snakes made in the 1970–1980s in Bengamisa village, on the right bank of the upper Congo River, about 50 km north of Kisangani, Tshopo Province, northeastern Democratic Republic of the Congo. Twenty-eight species are represented, distributed among 22 genera. We provide standard meristic and morphometric data for each specimen. We report clutch sizes for *Atractaspis boulengeri schmidti* and *Boaedon olivaceus*, and predation cases of *Hapsidophrys lineatus* on *Trachylepis maculilabris* (Squamata: Scincidae), of *Dendroaspis jamesoni* and *Boaedon olivaceus* on rodents (Rodentia: Muridae), and of *Causus maculatus* on *Sclerophrys* sp. (Anura: Bufonidae) and *Ptychadena* sp. (Anura: Ptychadenidae).

Keywords

Biodiversity, herpetofauna, Squamata, Equatorial Africa, Afrotropics, Tshopo, Democratic Republic of the Congo.

Introduction

The herpetofauna of the Democratic Republic of Congo (DRC) is still poorly documented, in particular in the northeastern part of the country. Within this region, some localities such as Kisangani have been relatively well prospected, but more data are needed to better define the composition and the ecology of the local reptile communities, as well as the role played by major rivers such as the Congo and the Ubangi as zoogeographical filters. In order to contribute to a wider set of data, we have already presented some collections made in Kungulu and Mbiye islands on the upper Congo River (Badjedjea et al., 2023), and in Amadjabe village, on the left bank of the Congo River, about 60 km south of Kisangani (Pauwels and Colyn, 2023), as well as some ecological notes (Brecko et al., 2019; Pauwels et al., 2022).

In order to further contribute to the herpetology of northeastern DRC, we present here another diverse snake collection made by one of us (MC) in the early 1980s in Bengamisa village, in the frame of a collaboration with the University of Kisangani. Bengamisa (0°58′15.9″N, 25°12′38.9″E) is located in Tshopo Province and lies along the left bank of the Lindi River, an affluent of the Congo River into which it flows near Kisangani. Bengamisa is situated about 50 airline km north of Kisangani.

Although, to the best of our knowledge, there is no published reptile record from Bengamisa, the locality is not totally absent from the herpetological literature. In his major paper on the chelonians, crocodiles and lacertilians of the "Belgian Congo," Schmidt (1919) provided "a list of localities from which specimens are recorded, with their approximate latitude and longitude," among which Bengamisa which is also shown on a map, but no specimens are actually mentioned from this locality in the text. In Schmidt's (1923) following work on snakes of the same region, Bengamisa is nowhere mentioned. An important contribution exists however in the gray literature. In his unpublished Master's thesis on the snakes of northeastern DRC, Kakolo (1979) indeed presented a list of 26 snake specimens caught in 1978 on the campus of the *Institut Supérieur d'Etudes Agronomiques* (ISEA) of Bengamisa, where they were deposited, preserved in formalin, in the zoology laboratory.

Material and Methods

Voucher specimens gathered by MC, in total 157 specimens, were opportunistically collected during a mammalogical survey, within a radius of five km around Bengamisa, i.e., on a total surface of about 80 sq km. They were injected and fixed *in situ* with 4% formalin, then preserved in 70% ethanol. MC's material was shared in 1985 between the University of Kisangani (75% of the specimens) and the University of Antwerp (25%, later donated to the Royal Belgian Institute of Natural Sciences, RBINS, Brussels). The specimens deposited in the 1970s and 1980s at the University of Kisangani are lost, similarly to the herpetological material deposited in the ISEA in Bengamisa, because of the *Guerre des Six Jours* in June 2000 (Badjedjea et al., 2023; Pauwels and Colyn, 2023; Mukirania and Musubaho, personal communication, 2023). However, MC took selected measurements and scale counts on each of these specimens before deposition in Kisangani, and we refer to them below using their field numbers (R). We also include in Appendix 1 the morphological data provided by Kakolo (1979) on his Bengamisa material, marked with a B, followed by a number corresponding to the listing order of specimens by Kakolo within each species in his thesis. In total, MC's and Kakolo's material combined, 181 snake specimens are analyzed here.

The material was (re-)identified in 2022 using the keys and morphological information provided by Schmidt (1923), de Witte and Laurent (1947), Laurent (1956, 1960), Broadley and

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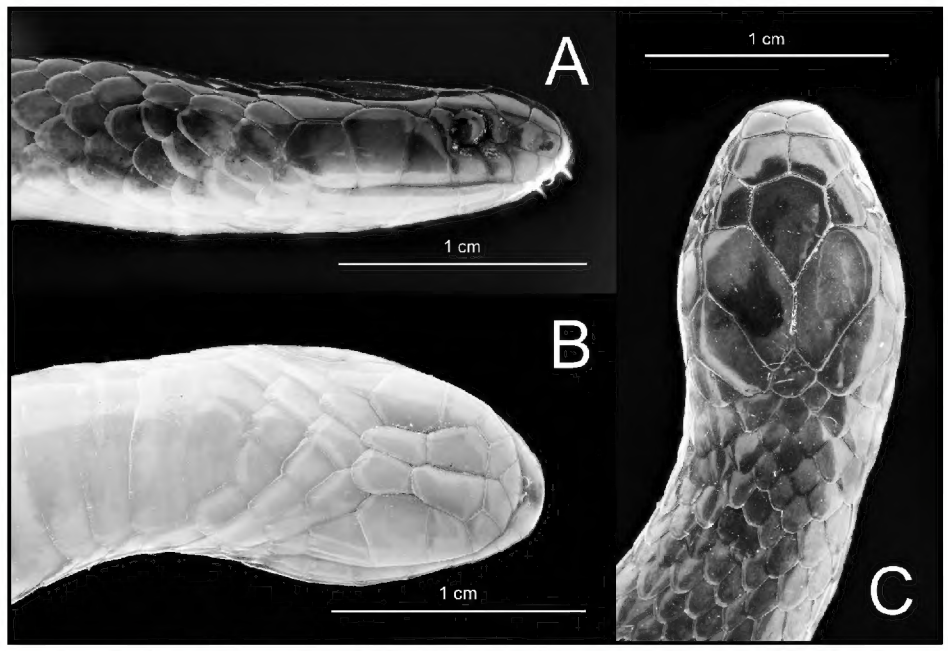

Figure 1. Head of a preserved adult female *Aparallactus modestus ubangensis* (RBINS 19686) from Bengamisa, DRC. A. Right profile. B. Ventral view. C. Dorsal view. Note the single postocular, and the contact between the 5th and 6th supralabials and the parietal.

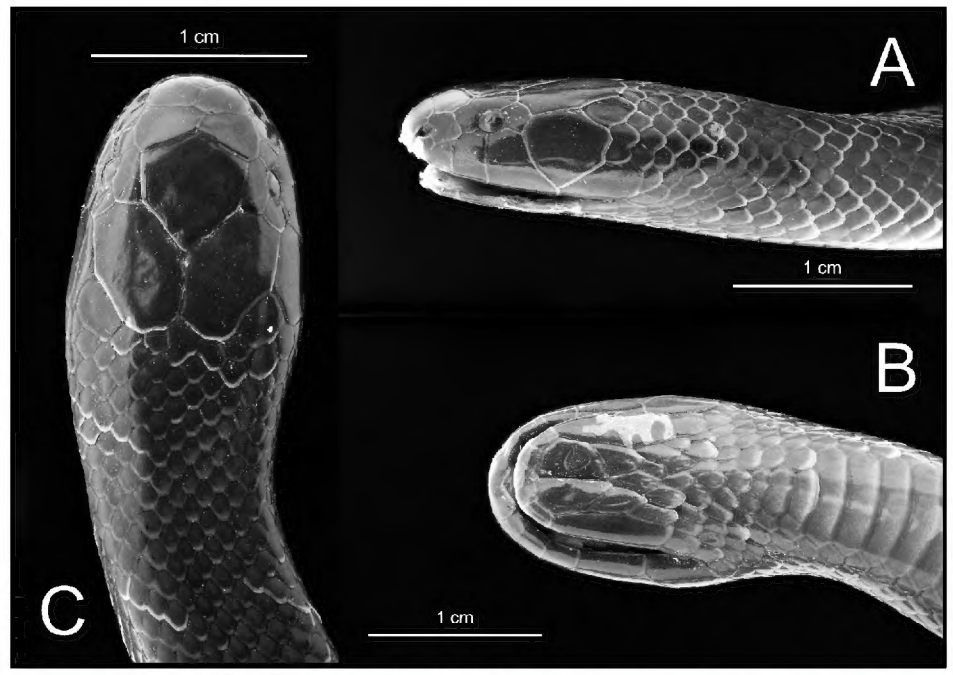

Figure 2. Head of a preserved adult female *Atractaspis boulengeri schmidti* (RBINS 19645) from Bengamisa, DRC. A. Left profile. B. Ventral view. C. Dorsal view. Note the contact between the mental and the sublinguals.

Wallach (2009), Greenbaum et al. (2015, 2021), Wüster et al. (2018), Chippaux and Jackson (2019), Rödel et al. (2019) and Pauwels and Colyn (2023).

Snake ventral scales of specimens deposited in the RBINS collections were counted according to the method of Dowling (1951). Snake dorsal scale rows were counted at one head-length behind the head, at midbody (above the ventral corresponding to half of the total number of ventrals), and at one head-length before the vent; subcaudal counts exclude the terminal pointed scale. Paired meristic characters are given left/right. The sex of specimens collected by MC was determined by dissection of the base of the tail. Morphometric and meristic data are presented in Appendix 1 (except for Typhlopidae).

Morphological abbreviations: A = anal plate; AT = anterior temporals; D = divided; DSR = number of dorsal scale rows; IL = (number of) infralabial(s) (followed in brackets by the number of IL in contact with the first pair of sublinguals); Juv. = juvenile; K = keeled; Lor = number of loreal scales; MSR = number of scale rows at midbody; PoO = (number of) postocular(s); PreO = (number of) preocular(s); PV = number of preventrals; S = single; SC = (number of) subcaudal(s); SL = (number of) supralabial(s) (followed in brackets by the SL in contact with orbit); SubO = number of suboculars; SVL = snout–vent length; TaL = tail length; U = unkeeled; VEN = (number of) ventral scales.

Results

Squamata
Atractaspididae
Aparallactus modestus ubangensis Boulenger, 1897
R 245 and RBINS 19668, 2 August 1984; R 592–595 and RBINS 19685–19686, 26 October 1985.

RBINS 19686 has its 44th VEN bifurcated on the right side, and its 46th VEN bifurcated on the left side; they were counted each as a single VEN. RBINS 19668 has only the 6th SL in contact with the parietal on both head sides. RBINS 19685 has only the 6th SL in contact with the parietal on the left side, and only the 5th on the right side. RBINS 19686 has both the 5th and 6th SL in contact with the parietal on both sides (Figure 1). This character was not noted for the specimens deposited in Bengamisa and Kisangani. Chippaux and Jackson (2019:166) explained that the subspecies *Aparallactus modestus ubangensis* is characterized by the contact of both the 5th and 6th SL with the parietal. Thus, this is not always the case, as already concluded by Pauwels and Colyn (2023) on a larger series from Amadjabe on the other side of the Congo River, and by Pauwels and Brecko (2020) on other DRC specimens.

Chippaux and Jackson (2019:164) also mentioned that *Aparallactus modestus* can be distinguished from other *Aparallactus* by the possession of two postoculars. In our sample of nine specimens, only three have two PoO on each side, one has one PoO on one side, two on the other, and all other specimens have only one PoO on both sides; this scalation character is thus also not diagnostic. Among the nine specimens from Bengamisa, only two have an entire tail. This is by far the most commonly encountered atractaspid in the region, as also noted by Pauwels and Colyn (2023).

Atractaspis boulengeri schmidti Laurent, 1945
RBINS 19645, 22 October 1985.

A single specimen of this rare subspecies was found in Bengamisa. It shows a divided nasal. The 4th SL is the largest (Figure 2). Temporal formula 1+3 on both sides of the head. Its first pair of IL is not in contact behind the mental; its mental is hence in contact with the single pair of sublinguals. Three gulars are in contact with the sublinguals. No IL fused with the sublinguals; 3rd IL very elongated. There is an additional half VEN on the right side just before the cloacal scale, not included in the VEN count. In preservative, the tail tip is blackish as the tail and dorsum. With a SVL of 445 mm, it is a pregnant female with three elongate eggs located between VEN 137 and 198. We measured the 2nd egg, which shows a length of 38 mm and a width of 10 mm. Among the currently recognized subspecies of *Atractaspis boulengeri*, a species in dire need of revision (Portillo et al., 2019), this specimen is closest to *schmidti*, although this subspecies is said to have the mental separated from the sublinguals (Laurent, 1945, 1950, 1956).

Atractaspis reticulata heterochilus Boulenger, 1901
R 244, 2 August 1984.

Only one specimen of this uncommon semi-fossorial snake

was found in Bengamisa. Its 2nd pair of IL is fused with the sublinguals. Its VEN and SC numbers (see Appendix 1) correspond with the variation recorded by Rödel et al. (2019) for the subspecies *heterochilus*, and it agrees with the scalation data provided by Laurent (1945: 340) for specimens from Kisangani. The Central African forms related to *Atractaspis reticulata* are poorly defined and need to be revised (Rödel et al., 2019). Revisions of several atractaspidine complexes such as this one are hampered by the rarity of museum material and the unavailability of genetically usable specimens.

Boidae
Calabaria reinhardtii (Schlegel, 1851)
R 596, 26 October 1985.

A single specimen found, an adult female.

Colubridae
Dipsadoboa weileri (Lindholm, 1905)
R 617, 26 October 1985.

Only one specimen, an adult male, was found in Bengamisa.

Hapsidophrys lineatus Fischer, 1856
R 142 and R 146, 26 March 1984; R 243, 2 August 1984; R 384, RBINS 19593, RBINS 19697 and RBINS 19708–19709, 24 February 1985.

RBINS 19593 has an extralabial between SL 2 and 3 on the left side. RBINS 19697 shows two apical pits per dorsal scale, while Chippaux and Jackson (2019: 331) mentioned that the genus lacks apical pits. Both hemipenes of RBINS 19709 are partly everted. Chippaux and Jackson (2019:331) mentioned that this species has two PreO, but all eight Bengamisa specimens for which this character was available showed a single PreO on both head sides; two PreO was also the least common state in the series from Amadjabe available to Pauwels and Colyn (2023; only two out of six specimens). The stomach of RBINS 19697 contains a skink ingested head first, whose forebody is digested, showing five keels per dorsal scale, and that we identify as *Trachylepis maculilabris* (Gray, 1845) (Scincidae).

Hapsidophrys smaragdinus (Schlegel, 1837)
R 138, R 141 and RBINS 19787, 26 March 1984; R 250 and RBINS 19788, 2 August 1984; R 366 and R 382, 24 February 1985; R 471, 2 June 1985; R 505, 13 June 1985; and R 601–603, 26 October 1985.

The last VEN of RBINS 19788 is bifurcated on the left side. On the right side of the same specimen, the prefrontal enters in contact with SL 3 and 4 behind the loreal. Combining the specimen examined by Kakolo (1979) and the ones gathered by MC, 13 individuals were collected in Bengamisa, which makes this species the third most commonly encountered in this village, after *Causus maculatus* and *Boaedon olivaceus*, both by far better represented.

Philothamnus carinatus (Andersson, 1901)
R 19, 9 February 1984; R 144, 26 March 1984; R 247 and R 249, 2 August 1984; and RBINS 19750, 24 February 1985.

In total six specimens are known from Bengamisa; all show 13 MSR. Half of them have an incomplete tail (see Appendix 1).

Philothamnus nitidus loveridgei Laurent, 1960
RBINS 19765, 24 February 1985.

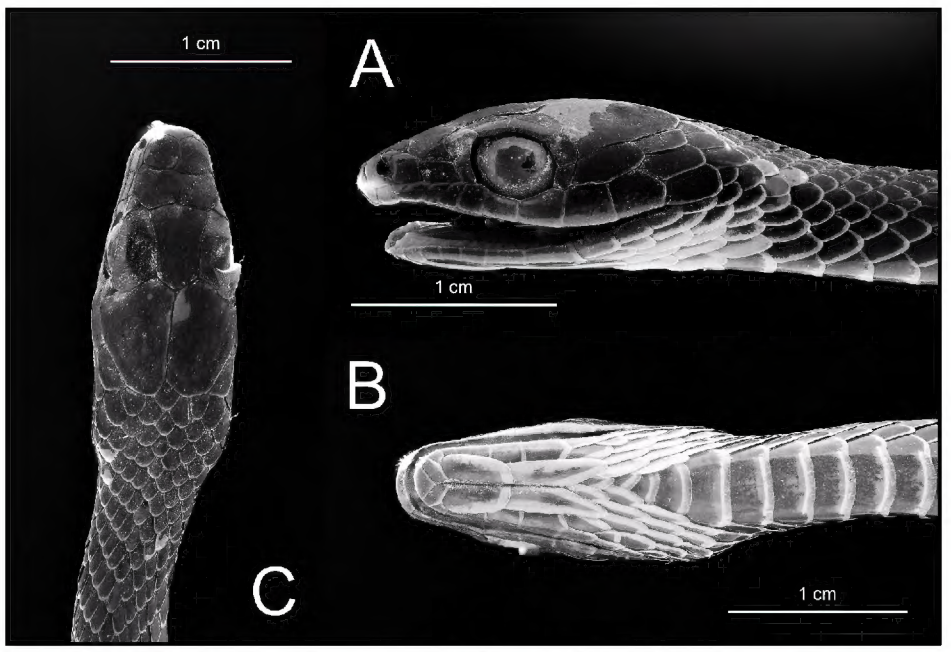

Figure 3. Head of a preserved adult female *Philothamnus nitidus loveridgei* (RBINS 19765) from Bengamisa, DRC. A. Left profile. B. Ventral view. C. Dorsal view. Note the temporal formula 1+2.

RBINS 19765, the single specimen found by MC in Bengamisa, shows a temporal formula of 1+2 on each side (Figure 3). Its PreO is not in contact with the frontal. Its anterior sublinguals are distinctly shorter than the posterior ones. It has one apical pit per dorsal; the pits are visible only on the anterior third of the dorsum. It is to be noted that Chippaux and Jackson (2019: 341) mentioned that the genus lacks apical pits. Based on its temporal formula, our Bengamisa specimen belongs to the eastern subspecies *loveridgei* described from Kivu, the nominal subspecies showing a formula of 2+2 (Chippaux and Jackson, 2019).

Kakolo (1979: 30) mentioned a single specimen of "*Philothamnus heterolepidotus* ?" from Bengamisa, and indicated that it had a SVL of 478 mm, a TaL of 265 mm, 9(4–6) SL, 10(5) IL, one PreO, two PoO, a temporal formula of 1+2, 15-15-11 DSR, 175 PV+VEN, a divided anal, and 130 divided SC. It is probably referable to *P. nitidus loveridgei*.

Rhamnophis aethiopissa ituriensis Schmidt, 1923
R 616, 26 October 1985.

As is typical for this eastern, poorly known subspecies (Boulenger, 1919; Laurent, 1956), this specimen shows 15 MSR, rather than 17 in the nominal, western subspecies.

Thelotornis kirtlandii (Hallowell, 1844)
R 600, 26 October 1985.

Only a single female of this arboreal snake was found in Bengamisa.

Thrasops jacksonii Günther, 1895

In addition to the morphological characters provided here in Appendix 1, Kakolo (1979: 33) mentioned that his single individual from Bengamisa had a round pupil, a temporal formula of 1+1, and a slightly enlarged vertebral scale row, which are typical characters for this arboreal snake.

Toxicodryas adamantea Greenbaum, Allen, Vaughan, Pauwels, Wallach, Kusamba, Muninga, Mwenebatu, Mali, Badjedjea, Penner, Rödel, Rivera, Sterkhova, Johnson, Tapondjou & Brown, 2021
R 240, 2 August 1984.

Kakolo (1979: 36) reported two specimens of this arboreal snake from Bengamisa under the binomen *Boiga pulverulenta*, a name formerly applied to the Congolese populations (see the

revision of the genus *Toxicodryas* by Greenbaum et al., 2021). Perhaps due to some mistypings in Kakolo's unpublished report written with a typewriter, the morphological data for the second specimen do not fully correspond to the variation known in *Toxicodryas adamantea*, so we do not include it in Appendix 1.

Toxicodryas vexator Greenbaum, Allen, Vaughan, Pauwels, Wallach, Kusamba, Muninga, Mwenebatu, Mali, Badjedjea, Penner, Rödel, Rivera, Sterkhova, Johnson, Tapondjou & Brown, 2021

Kakolo (1979: 35) reported two specimens of this large arboreal snake from Bengamisa under the name *Boiga blandingi* [sic, for *B. blandingii*]; for the second specimen only the head and neck were available to Kakolo.

Elapidae

Dendroaspis jamesoni (Traill, 1843)

R 470, 2 June 1985.

Only one specimen of this large, arboreal elapid was found in Bengamisa. The stomach of this adult female contained a rodent (Rodentia: Muridae).

Naja annulata annulata Peters, 1876

Kakolo (1979: 40) listed his single specimen from Bengamisa under the name *Boulengerina annulata annulata*; *Boulengerina* was confirmed to be embedded within the genus *Naja* by Nagy et al. (2005) and is currently regarded as a subgenus of *Naja*. Kakolo mentioned that its black rings were visible along the whole trunk, which is typical for the nominal subspecies of this aquatic cobra (Collet and Trape, 2020).

Naja melanoleuca Hallowell, 1857

R 241, 2 August 1984; R 469, 2 June 1985; and R 607–611, 26 October 1985.

Kakolo's and MC's specimens combined number eight. Only one of them has an incomplete tail. This is by far the most commonly encountered elapid snake in northeastern DRC.

Pseudohaje goldii (Boulenger, 1895)

RBINS 19774 (Figure 4), 12 February 1984.

Two specimens of this uncommon, semi-arboreal cobra are known from Bengamisa. About the single specimen he got from Bengamisa, Kakolo (1979: 42) mentioned that its tail was cut and healed. The same is true for RBINS 19774.

Lamprophiidae

Boaedon olivaceus (Duméril, 1856)

R 22 and RBINS 19728, 9 February 1984; R 23, 11 February 1984; R 115, R 117, R 124, R 128, R 133, R 143, R 145, R 211, RBINS 19729–19730, RBINS 19745 (Figure 5), RBINS 19796 and RBINS 19808, 26 March 1984; R 253–255, RBINS 19712 and RBINS 19752, 2 August 1984; R 321, 21 January 1985; R 377–378, RBINS 19673 and RBINS 19809, 24 February 1985; R 472–473, 2 June 1985; and R 625–632, 26 October 1985.

RBINS 19712 (SVL 696 mm) is a pregnant female with six well-developed eggs located between VEN 123 and 190; we measured the posteriormost egg, which shows a length of 39 mm and a maximum width of 17 mm. The juvenile female RBINS 19808 (SVL 307 mm) and the juvenile male RBINS 19809 (SVL 236 mm) show umbilical scars, on VEN 184–186 and 169–171, respectively. In RBINS 19712 there is an additional

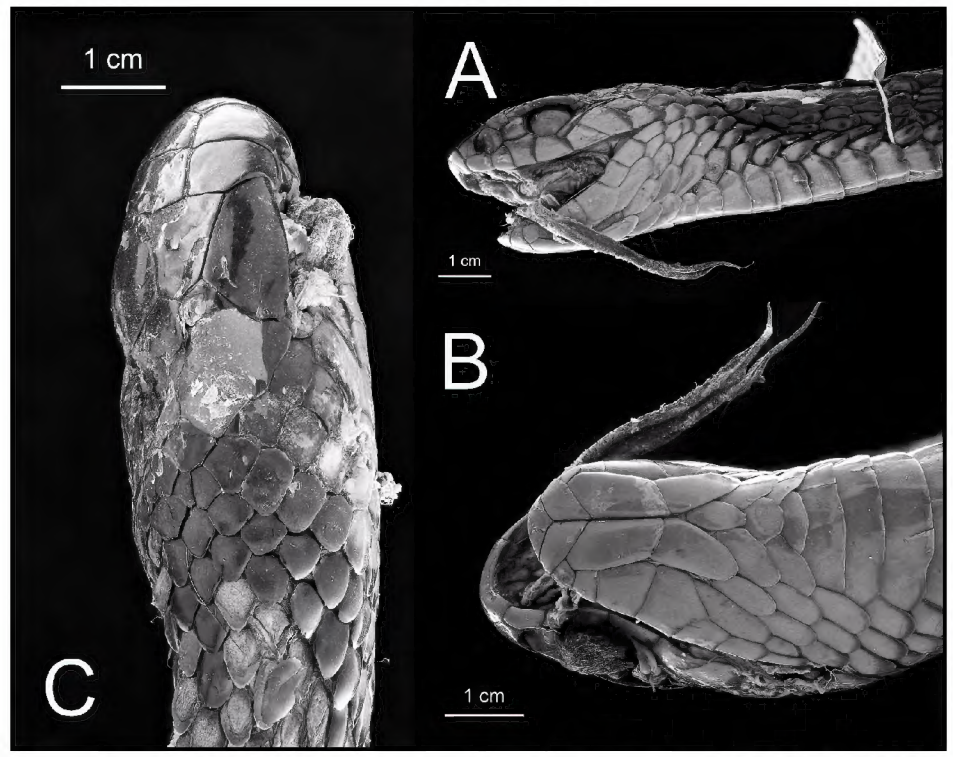

Figure 4. Head of a preserved adult female *Pseudohaje goldii* (RBINS 19774) from Bengamisa, DRC. A. Left profile. B. Ventral view. C. Dorsal view. The right side of the head is in poor condition because it was hit by a machete.

half VEN on the left side between VEN 38 and 39; in RBINS 19730 there is an additional half VEN on the left side just before the anal scale; these half VEN were not included in the VEN count. In their description of *Boaedon radfordi*, Greenbaum et al. (2015) mentioned that *B. olivaceus* usually has three SL in contact with the orbit. In our Bengamisa material, left and right sides of the head combined (see Appendix 1), there are two SL in contact with the orbit in 83%, and three in only 17%. The possession of three versus two SL in contact with the orbit was used in the key to *Boaedon* by Chippaux and Jackson (2019) to distinguish *B. olivaceus* from *B. radfordi*. In a sample from Amadjabe, just on the other side of the Congo River, Pauwels and Colyn (2023) noted a near-opposite proportion: 18% of cases with two SL in contact with the orbit, and 82% with three. Within our material there is a clear sexual dimorphism in VEN, males having 185–196, females 200–210, and in SC, 52–55 in males and 40–45 in females. These numbers are very close to those noted by Pauwels and Colyn (2023) on a series of 24 specimens from Amadjabe, and agree with the variation indicated for *Boaedon olivaceus* by Greenbaum et al. (2015). Males show 25 to 27 MSR, females 25 to 29. As noted by Pauwels and

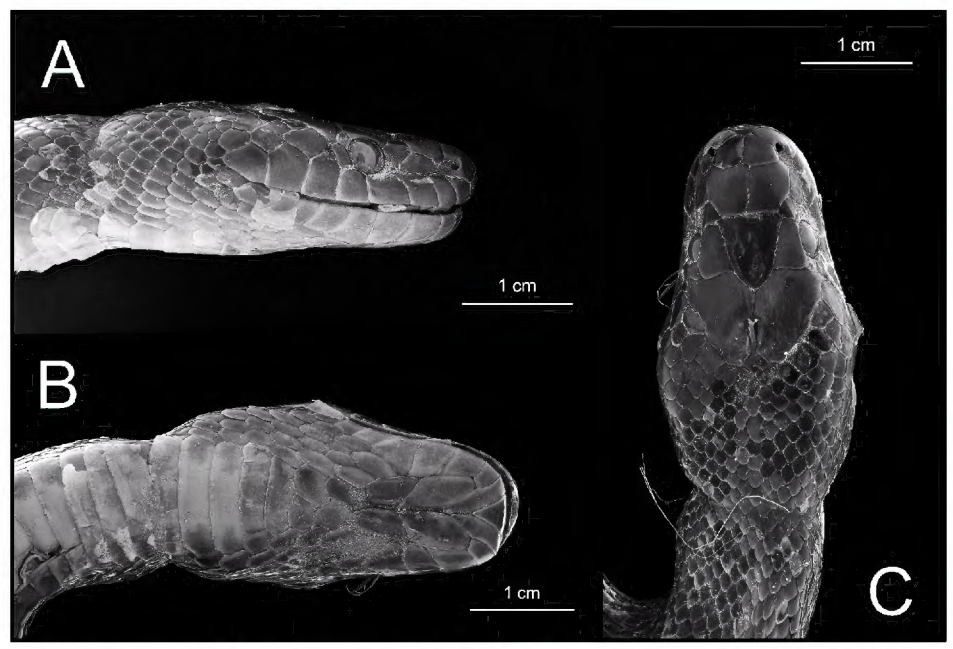

Figure 5. Head of a preserved adult female *Boaedon olivaceus* (RBINS 19745) from Bengamisa, DRC. A. Right profile. B. Ventral view. C. orsal view. Note the two supralabials in contact with the orbit, and the lack of stripes on the head.

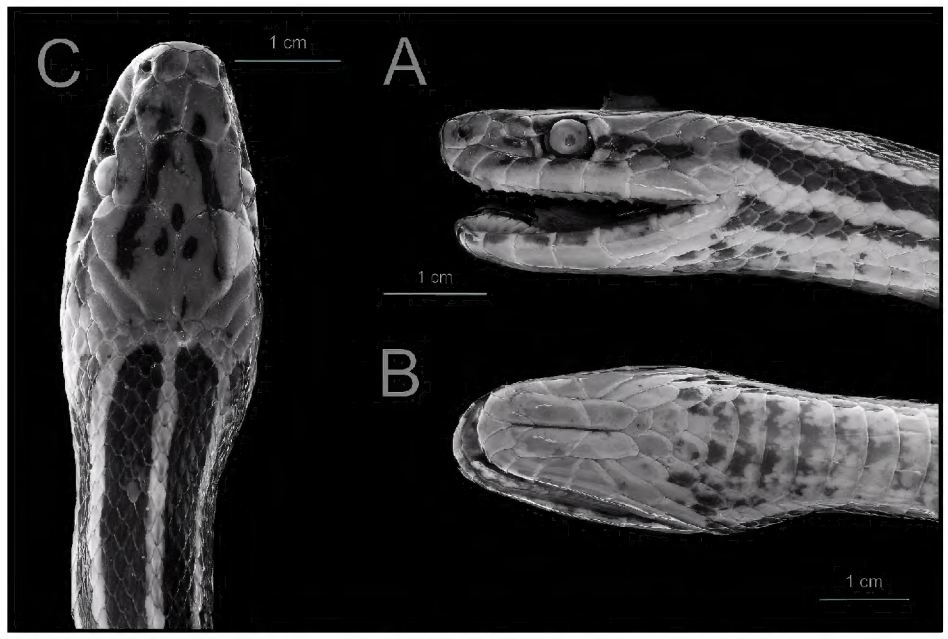

Figure 6. Head of a preserved adult female *Bothrophthalmus lineatus* (RBINS 19790) from Bengamisa, DRC. A. Left profile. B. Ventral view. C. Dorsal view. The dorsal stripes distinguish this species from *Bothrophthalmus brunneus*.

Colyn (2023), only females have as many as 28 or 29 MSR. Based on the number of specimens (37) listed in Appendix 1, *Boaedon olivaceus* appears to be the second most commonly encountered snake in Bengamisa, after *Causus maculatus*. The stomach of RBINS 19745 contains a rodent (Rodentia: Muridae).

Bothrophthalmus lineatus (Peters, 1863)
R 118 and R 125, 26 March 1984; RBINS 19790 (Figure 6), 24 February 1985.

Kakolo (1979: 25) listed a single specimen from Bengamisa. Besides a few morphological data shown here in Appendix 1, Kakolo mentioned typical characters for this species, shown by this specimen, in particular a round pupil, a light red belly, black dorsum with red stripes, and a concave area between the nasal scale and the eye. Three of the four Bengamisa specimens have an intact tail, contrasting with the 80% of incomplete tails observed in a series of five specimens from Amadjabe (Pauwels and Colyn, 2023). All specimens showed the striped pattern typical of this taxon, that we regard as specifically distinct from *Bothrophthalmus brunneus* Günther, 1863.

Limaformosa savorgnani (Mocquard, 1887)

A single specimen was reported by Kakolo (1979) from Bengamisa (see Appendix 1).

Mehelya poensis (Smith, 1849)
R 122, 26 March 1984; R 371 and R 373–374, 24 February 1985; and R 506, 13 June 1985.

Including the two specimens examined by Kakolo (1979), seven specimens are known from Bengamisa.

Pythonidae
Python sebae (Gmelin, 1789)
R 258–259, RBINS 19684, 2 August 1984.

All three Bengamisa individuals were juveniles. RBINS 19684 has 8/7 circumorbital scales (Figure 7).

Typhlopidae
Afrotyphlops cf. *angolensis* (Bocage, 1866)
R 477, 2 June 1985; R 499–500, 13 June 1985; RBINS 19736 (Figure 8), 24 February 1985; RBINS 19744, 26 October 1985.

R 477 showed a SVL of 354 mm, a TaL of 6 mm, a midbody

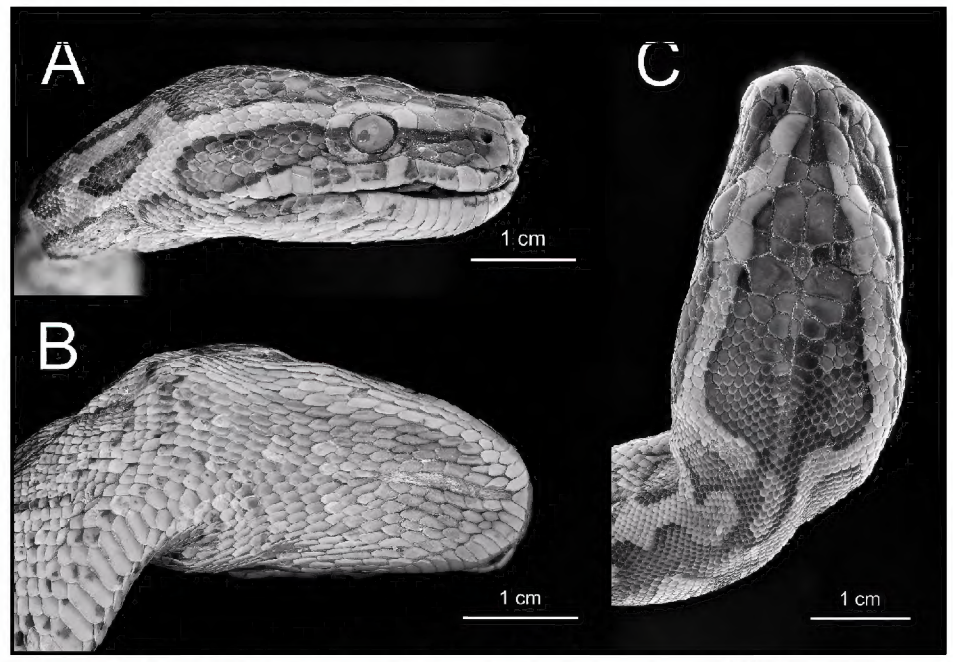

Figure 7. Head of a preserved juvenile *Python sebae* (RBINS 19684) from Bengamisa, DRC. A. Right profile. B. Ventral view. C. Dorsal view.

diameter of 11 mm, a tail width of 8 mm, and 24 smooth MSR. R 499 showed a SVL of 249 mm, a TaL of 5 mm, a tail width of 8 mm, and 26 smooth MSR. R 500 showed a SVL of 271 mm, a TaL of 5 mm, a tail width of 8 mm, and 25 smooth MSR. All three had a striped dorsal pattern with black dots and a lightcolored belly. Kakolo (1979: 23) mentioned a *Typhlops* sp. caught in Bengamisa, gave its SVL (439 mm), diameter at midbody (13 mm), TaL (6 mm) and tail width (11 mm), and mentioned that its dorsum was dark with a light spot on each scale. RBINS 19736 shows a SVL of 270 mm, a TaL of 4 mm, and a midbody diameter of 12 mm; it has 310 scales between the frontal and a point above the cloaca, 26-26-24 smooth scale rows around the body, and eight SC. RBINS 19744 shows a SVL of 467 mm, a TaL of 5 mm, and a midbody diameter of 14 mm; it has 335 scales between the frontal and a point above the cloaca, 28-26-24 smooth scale rows around the body, and nine SC. In both RBINS specimens the eyes and pupils are clearly visible through the preocular and the ocular scales. Their snout is rounded in dorsal view, obtusely angular in lateral view, and lacks a keratinized edge. The dorsal rostral is broad, nearly as broad as the interocular distance, and truncated posteriorly. The nostril is pierced laterally. The inferior nasal suture contacts the 1st SL and the rostral. It has 4/4 SL. The preocular is overlapped

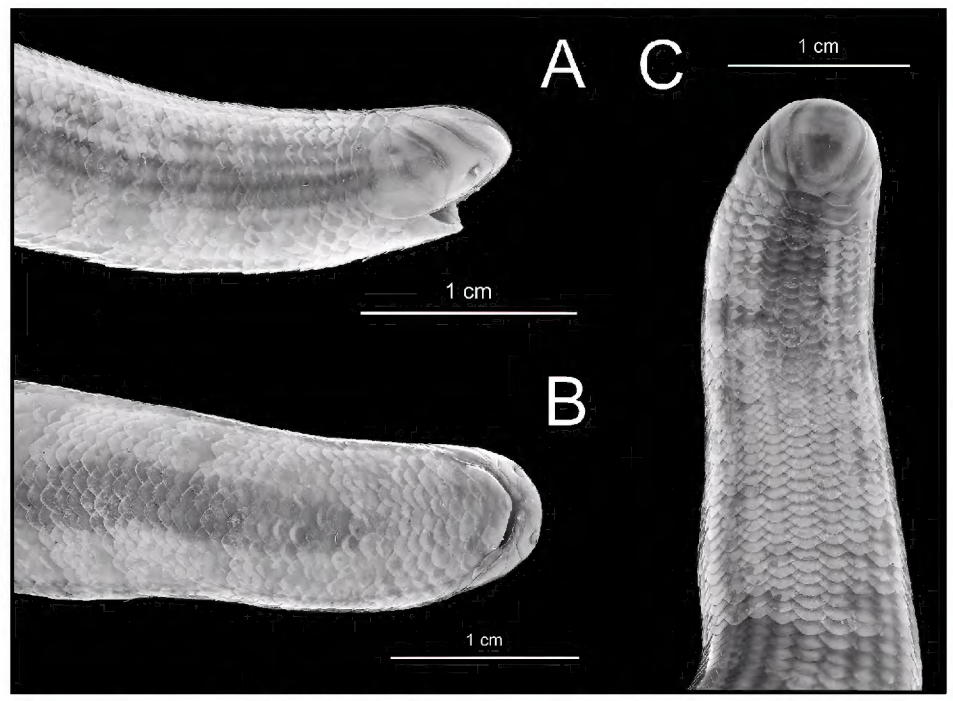

Figure 8. Head and forebody of a preserved adult *Afrotyphlops* cf. *angolensis* (RBINS 19736) from Bengamisa, DRC. A. Right profile. B. Ventral view. C. Dorsal view. The eye is visible through the ocular and preocular.

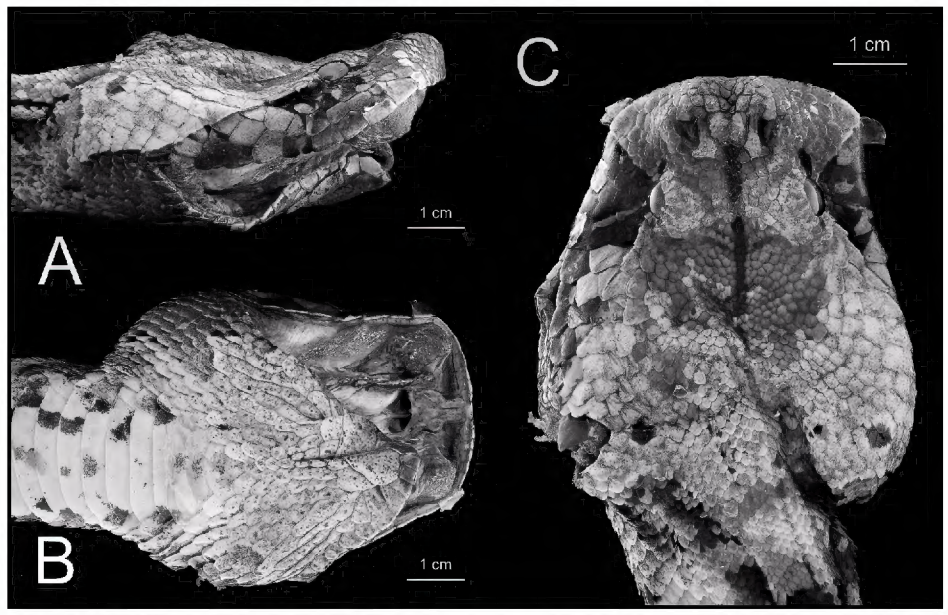

Figure 9. Head of a preserved female *Bitis gabonica* (RBINS 19802) from Bengamisa, DRC. The head is in poor condition because it was hit by a stick. A. Right profile. B. Ventral view. C. Dorsal view.

by the 2nd SL. No subocular separates the preocular from the 2nd and 3rd SL. The ocular is about twice the size of the preocular. The supraocular is transverse, with its lateral apex between the preocular and the ocular. Both show a uniform reticulate dorsal pattern forming black lines along the whole dorsum, fading on flanks; the venter is uniformly yellow.

Although the four specimens deposited in Bengamisa and Kisangani could not be re-examined, based on the available morphological and coloration data and the locality, we believe that they correspond to the taxon also represented here by the two specimens deposited at the RBINS, and by the specimens identified as *Afrotyphlops* cf. *angolensis* by Pauwels and Colyn (2023).

Viperidae
Atheris squamigera (Hallowell, 1854)
R 587 and R 597–599, 26 October 1985.
In total five specimens of this arboreal viper are recorded from Bengamisa.

Bitis gabonica (Duméril, Bibron & Duméril, 1854)
R130, 26 March 1984; R 368 and RBINS 19802, 24 February 1985; and R 606, 26 October 1985.

Only the head of R130 was available to MC, and its head scalation was not noted, so it is not included in Appendix 1. RBINS 19802 (Figure 9) shows 12 circumocular scales on the left side (right side damaged). Besides the five Bengamisa specimens listed here in Appendix 1, Kakolo (1979: 44) examined the head of another specimen; this head showed a length of 80 mm and a maximum width of 50 mm. Kakolo mentioned that both specimens he examined showed the typical thin brown midline on the upper surface of the head, and two horn-like elongate scales between the nostrils.

Bitis nasicornis (Shaw, 1802)
R 242, 2 August 1984; and R 604–605, 26 October 1985.

Kakolo (1979: 45) mentioned that his single specimen from Bengamisa showed a black triangle on the dorsal surface of its head, and two nasal horns each made of two or three prominent scales.

Causus lichtensteini (Jan, 1859)
R 89, 26 May 1983; R 123, 26 March 1984; and R 622–624, 26 October 1985.

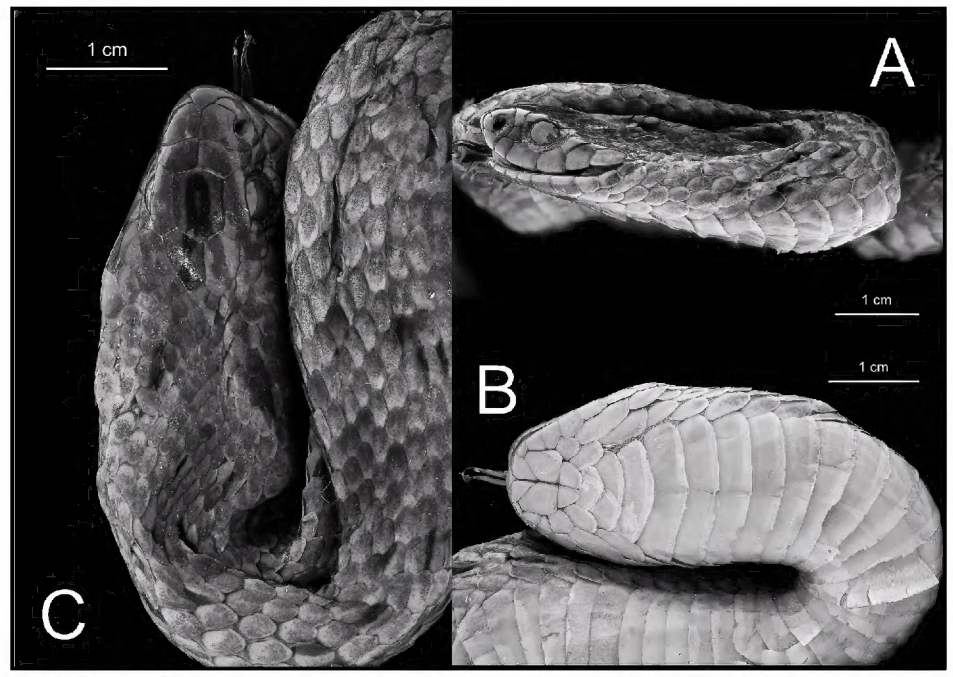

Figure 10. Head and forebody of a preserved adult female *Causus maculatus* (RBINS 19590) from Bengamisa, DRC. A. Left profile. B. Ventral view. C. Dorsal view. The suture between the internasals is about as long as the suture between the prefrontals.

Six specimens are recorded from Bengamisa. This indicates that it is not locally a rare species, although it is much less represented than the congeneric *Causus maculatus*; see below.

Causus maculatus (Hallowell, 1842)
R 116, R 119–120, R 127, R 129, R 136, R 140, RBINS 19702 and RBINS 20030, 26 March 1984; R 264, R 266–267, R 269–270, RBINS 19587–19591, RBINS 19738 and RBINS 20031, 2 August 1984; RBINS 19753, 16 February 1985; R 388, R 390–393, RBINS 19592 and RBINS 19737, 24 February 1985; R 474–476, 2 June 1985; R 501–503, 12 June 1985; and R 618–621, 26 October 1985.

According to Chippaux and Jackson (2019), in *Causus maculatus* the suture between the internasals is as long as, or longer than the suture between the prefrontals (which helps to differentiate it from *C. rhombeatus*), and this is confirmed in our series. In RBINS 19592, RBINS 19702, RBINS 19737–19738 and RBINS 20030, the suture between the internasals is about as long as the suture between the prefrontals; in RBINS 19589–19591 (Figure 10), RBINS 19753 and RBINS 20031 it is slightly longer; in RBINS 19587–19588 it is distinctly longer. This character was not noted for the specimens deposited in Bengamisa and Kisangani. Keels are found on dorsals along the whole body, but more developed posteriorly, and more developed in males than in females. There is a well-marked sexual dimorphism in the number of SC, with 18–22 in males and 12–18 in females. In our series, there are 129–135 PV+VEN in males, and 136–152 PV+VEN in females. All specimens show a V-shaped mark, pointing anteriorly, on the dorsal surface of the head. The left hemipenis of RBINS 19702 is partly everted. RBINS 20030 is a pregnant female, but the poor condition of its eggs did not allow us to precisely count them. The stomach of R 474 contained a *Sclerophrys* sp. (Anura: Bufonidae). The stomach of RBINS 19589 contains an adult *Sclerophrys* sp. ingested head first, and numerous large nematod worms. That of RBINS 19737 contains a partly digested adult *Ptychadena* sp. (Anura: Ptychadenidae), ingested head first. Kakolo (1979: 43) listed three specimens from Bengamisa under *Causus rhombeatus rhombeatus*. Based on the high number of specimens (42!) listed in Appendix 1, this snake taxon seems to be the most commonly encountered in Bengamisa.

Discussion

As noted by Badjedjea et al. (2023) the collections deposited at the University of Kisangani in the 1970–1980s were not curated and are lost, which represents 75% (117 specimens) of the collection made by MC in Bengamisa and under study here (it represented a loss of 55% of the snake collection from Amadjabe studied by Pauwels and Colyn, 2023). The snake collection examined by Kakolo in Bengamisa is also entirely lost. Fortunately the main diagnostic characters of these specimens had been noted before deposition, and leave no doubts about the taxonomic identifications made above. No snake from Bengamisa is registered in the collections of the Royal Museum for Central Africa (RMCA) in Tervuren, although a few other reptiles from this area have been deposited by MC in RMCA (in particular, seven *Kinixys erosa* [Testudinidae], registered under the numbers RMCA-Vert-1986.022.R.0064 and RMCA-Vert-1986.022.R.0132-0137, from "Piste Bengamisa–Weko, km 18.")

None of the 28 species listed above had been published from Bengamisa so far. The present report contributes to a better mapping of these species' distributions in a herpetologically understudied region. However a number of additional snake species should be recorded from Bengamisa in the future. It is expected that the snake fauna of Bengamisa also includes more species within several of the genera represented above, as well as representatives of the genera *Polemon* (Atractaspididae), *Dasypeltis*, *Grayia*, *Scaphiophis* (Colubridae), *Chamaelycus*, *Dendrolycus*, *Gonionotophis*, *Hormonotus*, *Lycophidion* (Lamprophiidae), *Hydraethiops*, *Natriciteres* (Natricidae), *Letheobia* (Typhlopidae) and *Buhoma* (incertae sedis).

An examination of the distribution maps provided by Chippaux and Jackson (2019) illustrates the knowledge gaps in the snake faunas inhabiting both banks of the upper Congo River. Each additional record accompanied by morphological data will help to better understand the impact of the Congo and Ubangi rivers on the distribution of snakes (the "barrière Congo-Ubangi" as called by Laurent, 1960). The accumulation of large morphological datasets, in combination with genetic analyses, will eventually permit to clarify how this zoogeographical filter impacts the various snake taxa, as was recently done for the genus *Toxicodryas* (Greenbaum et al., 2021). Similar large-scale revisions on additional genera will undoubtedly reveal new taxa or revalidate synonyms.

Acknowledgments

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Appendix 1

Morphological data for snakes (except Typhlopidae) collected in Bengamisa, Democratic Republic of the Congo. Measurements in mm. F = female; M = male; FF indicates pregnant females. NA = not available/not assessed. For the other abbreviations see Materials and Methods. For B and R specimens, preventrals and ventrals are not separated.

Species / Specimen	Sex	SVL	TaL	DSR	PV+VEN	A	SC	SL	IL	Lor	PreO	SubO	PoO	AT
Atractaspididae														
Aparallactus modestus ubangensis														
B7	NA	368	≥66	15-15-15, U	150, U	S	≥44, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	2/2	NA
R 245	M	NA	NA	15-15-15, U	133, U	S	>16, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	1/1	0/0
R 592	M	NA	NA	13?-15-15, U	138, U	S	>26, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	1/1	0/0
R 593	M	NA	NA	13?-15-15, U	136, U	S	>34, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	1/2	0/0
R 594	F	NA	NA	15-15-15, U	148, U	S	>14, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	1/1	0/0
R 595	F	NA	NA	15-15-15, U	145, U	S	41, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	2/2	0/0
RBINS 19668	M	335	83	15-15-15, U	1+136, U	S	47, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	1/1	0/0
RBINS 19685	M	346	>54	15-15-15, U	1+137, U	S	>27, S, U	7(3-4)/7(3-4)	6(4)/6(4)	0/0	1/1	0/0	2/2	0/0
RBINS 19686	F	390	>28	15-15-15, U	1+146, U	S	>14, S, U	7(3-4)/6(2-3)	6(4)/6(4)	0/0	1/1	0/0	1/1	0/0
Atractaspis boulengeri schmidti														
RBINS 19645	FF	445	35	22-23-19, U	3+206, U	S	14S+9D, U	5(3-4)/5(3-4)	5(3)/5(3)	0/0	1/1	0/0	1/1	1/1
Atractaspis reticulata heterochilus														
R 244	F	618	25	19-23-21, U	348, U	D	21, D, U	5(3-4)/5(3-4)	4/4	0/0	1/1	0/0	1/1	1/1

Species / Specimen	Sex	SVL	TaL	DSR	PV+VEN	A	SC	SL	IL	Lor	PreO	SubO	PoO	AT
Boidae														
Calabaria reinhardtii														
R 596	F	609	56	30-35-26, U	228, U	S	24, S, U	8/8	9/9	NA	1/1	0/0	2/2	NA
Colubridae														
Dipsadoboa weileri														
R 617	M	624	139	19-17-13, U	187, U	S	64, S, U	9(4-6)/9(4-6)	11(5)/11(5)	1/1	1/1	0/0	2/2	1/1
Hapsidophrys lineatus														
B2	NA	711	289	15-15-11, K	163, K	S	105, D, K	8(4-5)/8(4-5)	10(5)/10(5)	1/1	1/1	0/0	2/2	2/2
R 142	M	NA	NA	15-15-11, K	161, K	S	111, D, K	8(4-5)/8(4-5)	10(5)/10(5)	1/1	1/1	0/0	3/3	2/2
R 146	M	NA	NA	15-15-11, K	165, K	S	106, D, K	9(5-6)/8(4-5)	11(6)/10(5)	1/1	1/1	0/0	2/2	2/2
R 243	F	841	243	15-15-11, K	168, K	S	110, D, K	8(4-5)/8(4-5)	10(5)/10(5)	1/1	NA	0/0	NA	2/2
R 384	M	NA	NA	15-15-11, K	162, K	S	105, D, K	8(4-5)/9(5-6)	10(5)/9(5)	1/1	1/1	0/0	2/2	3/3
RBINS 19593	M	690	295	15-15-11, K	1+160, K	S	106, D, K	8(4-5)/9(4-6)	9(5)/9(5)	1/1	1/1	0/0	2/2	2/2
RBINS 19697	F	770	>173	15-15-11, K	1+167, K	S	>48, D, K	8(4-5)/8(4-5)	10(5)/10(5)	1/1	1/1	0/0	2/3	2/2
RBINS 19708	M	719	303	15-15-11, K	1+166, K	S	111, D, K	9(5-6)/9(5-6)	9(5)/10(5)	1/1	1/1	0/0	2/2	2/2
RBINS 19709	M	782	≥336	15-15-11, K	1+167, K	S	≥110, D, K	8(4-5)/8(4-5)	9(5)/9(5)	1/1	1/1	0/0	2/2	2/2
Hapsidophrys smaragdinus														
B2	NA	570	≥323	15-15-NA, K	160, K	D	≥131, D, K	NA	NA	NA	NA	NA	NA	1/1
R 138	F	NA	NA	15-15-11, K	151, K	D	143, D, K	9(4-6)/9(4-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 141	F	NA	NA	15-15-11, K	159, K	D	>106, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 250	F	NA	NA	15-15-11, K	160, K	D	143, D, K	9(4-6)/9(4-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 366	F	NA	NA	15-15-11, K	158, K	D	147, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 382	F	NA	NA	15-15-11, K	161, K	D	145, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 471	M	NA	NA	15-15-11, K	155, K	D	148, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 505	F	NA	NA	15-15-11, K	163, K	D	145, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 601	F	NA	NA	15-15-11, K	157, D	D	141, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 602	F	NA	NA	15-15-11, K	162, D	D	146, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
R 603	F	NA	NA	15-15-11, K	157, D	D	144, D, K	9(5-6)/9(5-6)	NA(5)/NA(5)	1/1	1/1	0/0	2/2	1/1
RBINS 19787	M	562	371	15-15-11, K	1+158, K	D	156, D, K	9(5-6)/9(5-6)	9(5)/9(5)	1/1	1/1	0/0	2/2	1/1
RBINS 19788	F	590	>356	15-15-11, K	1+159, K	D	>141, D, K	9(5-6)/9(5-6)	10(6)/9(5)	1/1	1/1	0/0	2/2	1/1
Philothamnus carinatus														
B1	NA	481	>186	13-13-11, U	152, K	S	>80, D, U	8(4-6)/ 8(4-6)	NA	NA	NA	NA	NA	NA
R 19	M	NA	NA	13-13-11, U	151, K	S	82, D, U	8(4-6)/ 8(4-6)	9(5)/9(5)	1/1	1/1	0/0	2/2	2/2
R 144	M	NA	NA	13-13-11, U	155, K	S	>64, D, U	9(4-6)/ 8(4-6)	9(5)/8(5)	1/1	1/1	0/0	2/2	2/2
R 247	F	NA	NA	13-13-11, U	160, K	S	>28, D, U	9(4-6)/ 9(4-6)	10(4)/ 10(5)	1/1	1/1	0/0	2/2	2/2
R 249	M	NA	NA	13-13-11, U	147, K	S	86, D, U	9(4-6)/ 9(4-6)	10(5)/ 10(5)	1/1	1/1	0/0	2/2	2/2
RBINS 19750	M	460	174	13-13-11, U	2+150, K	S	83, D, U	9(4-6)/ 9(4-6)	10(5)/ 10(5)	1/1	1/1	0/0	2/2	2/2
Philothamnus nitidus loveridgei														
RBINS 19765	F	492	>269	15-15-11, U	1+168, K	D	>117, K	10(5-7)/9(4-6)	10(5)/ 10(5)	1/1	1/1	0/0	2/2	1/1
Rhamnophis aethio-pissa ituriensis														
R 616	NA	NA	NA	15-15-11	160, K	D	138, D, K	8(4-5)/7(4-5)	11(6)/ 10(5)	1/1	1/1	0/0	3/3	1/1
Thelotornis kirtlandii														
R 600	F	NA	NA	19-19-13, K	178, U	D	≥128, D, U	8(4-5)/8(4-5)	9(3)/ 9(3)	1/1	1/1	NA	NA	1/1
Thrasops jacksonii														
B1	NA	881	≥379	21-19-13, K	204	D	≥138, D	8(4-5)/8(4-5)	11(4)/11(4)	1/1	1/1	0/0	3/3	1/1
Toxicodryas adamantea														
B1	F	721	190	23-19-11?	265	S	119, D	9(4-6)/9(4-6)	12(5)/12(5)	1/1	1/1	0/0	2/2	2/2
R 240	M	759	225	21-19-15, U	264	S	121, D	8(3-5)/8(3-5)	12(5)/12(5)	1/1	1/1	0/0	2/2	2/2
Toxicodryas vexator														
B1	F	1417	>380	23-23-15, U	266	NA	>113, D	8(4-5)/9(5-6)	14(5)/13(4)	1/1	2/2	0/0	2/2	2/2
B2	M	>75	NA	23-NA-NA, U	NA	NA	NA	9(4-6)/9(4-6)	13(4)/13(4)	1/1	2/2	0/0	2/2	2/2

Species / Specimen	Sex	SVL	TaL	DSR	PV+VEN	A	SC	SL	IL	Lor	PreO	SubO	PoO	AT
Elapidae														
Dendroaspis jamesoni														
R 470	F	1335	410	19-17-13, U	221, U	D	102, D, U	8(4)/8(4)	10(4)/10(4)	0/0	3/3	1/1	3/3	1/1
Naja annulata annulata														
B2	NA	1306	≥364	23-21-17, U	202, U	NA	≥71, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	0/0	2/2	1/1
Naja melanoleuca														
B5	NA	511	≥99	23-19-13, U	223, U	NA	≥60, D, U	7(3-4)/7(3-4)	NA	0/0	1/1	NA	NA	1/1
R 241	M	447	100	27-19-13, U	214, U	S	64, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 469	NA	NA	NA	23-19-15, U	221, U	S	64, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 607	NA	NA	NA	23-19-15, U	213, U	S	63, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 608	NA	NA	NA	23-19-15, U	223, U	S	67, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 609	NA	NA	NA	23-19-13, U	220, U	S	62, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 610	NA	NA	NA	23-19-13, U	215, U	S	64, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
R 611	NA	NA	NA	23-19-13, U	221, U	S	68, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	NA	NA	1/1
Pseudohaje goldii														
B1	NA	1315	>55	15-15-11, U	194	S	>11, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	0/0	3/3	1/1
RBINS 19774	F	1665	>400	15-15-11, U	1+194, U	S	>63, D, U	7(3-4)/7(3-4)	8(4)/8(4)	0/0	1/1	0/0	2/2	1/1
Lamprophiidae														
Boaedon olivaceus														
B7	M	278	63	23-25-21, U	193, U	S	55, S, U	8(4-5)/8(4-5)	9(3)/9(3)	NA	NA	NA	NA	NA
R 22	F	NA	NA	27-27-21, U	210, U	S	45, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 23	F	NA	NA	27-25-21, U	200, U	S	40, S, U	8(4-5)/8(4-5)	9(4)/10(4)	1/1	1/1	0/0	2/2	1/1
R 115	F	NA	NA	27-27-21, U	209, U	S	43, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 117	M	NA	NA	27-27-21, U	190, U	S	52, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 121	M	NA	NA	23-25-19, U	189, U	S	54, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	2/2	0/0	2/2	1/1
R 124	F	NA	NA	25-27-21, U	210, U	S	44, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 128	F	NA	NA	25-29-21, U	206, U	S	44, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	2/2	0/0	2/2	1/1
R 133	F	NA	NA	27-27-21, U	206, U	S	43, S, U	8(4-5)/8(3-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 143	M	NA	NA	27-27-21, U	193, U	S	>51, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 145	M	NA	NA	25-27-21, U	189, U	S	53, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 253	F	NA	NA	27-27-21, U	208, U	S	45, S, U	8(4-5)/8(4-5)	9(3)/9(3)	1/1	1/1	0/0	2/2	1/1
R 254	M	NA	NA	27-27-21, U	192, U	S	52, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 255	F	NA	NA	25-27-21, U	205, U	S	40, U	8(4-5)/9(4-6)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 321	F	NA	NA	28-29-21, U	210, U	S	42, S, U	8(4-5)/9(4-6)	9(3)/9(3)	1/1	1/1	0/0	2/2	1/1
R 377	M	NA	NA	27-27-21, U	185, U	S	52, S, U	8(3-5)/8(3-5)	9(3)/9(3)	1/1	1/1	0/0	2/2	1/1
R 378	F	NA	NA	27-29-21, U	208, U	S	44, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	2/1
R 472	F	NA	NA	27-27-21, U	209, U	S	44, S, U	NA	NA	1/1	1/1	0/0	2/2	NA
R 473	M	NA	NA	27-27-19, U	192, U	S	54, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 625	F	NA	NA	27-27-20, U	206, U	S	42, S, U	9(4-6)/9(4-6)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 626	M	NA	NA	27-27-21, U	190, U	S	52, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 627	M	NA	NA	27-27-21, U	191, U	S	53, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 628	F	NA	NA	27-29-21, U	204, U	S	40, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 629	F	NA	NA	31-29-21, U	206, U	S	42, S, U	8(3-5)/8(3-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 630	M	NA	NA	27-25-19, U	196, U	S	52, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 631	F	NA	NA	29-27-21, U	204, U	S	43, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
R 632	F	NA	NA	27-27-21, U	200, U	S	41, S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19673	F	251	36	27-29-21, U	2+206, U	S	1D+42S, U	8(4-5)/9(4-6)	8(4)/8(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19712	FF	696	110	23-27-21, U	2+203, U	S	1D+43S, U	8(3-5)/8(4-5)	8(3)/9(3)	1/1	1/1	0/0	2/2	1/1
RBINS 19728	F	521	77	25-28-21, U	3+202, U	S	1D+40S, U	8(4-5)/8(4-5)	9(4)/8(3)	1/1	2/2	0/0	2/2	1/1
RBINS 19729	M	547	121	26-27-21, U	3+194, U	S	55, S, U	9(4-6)/NA	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19730	M	490	108	25-27-21, U	2+188, U	S	1D+52S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19745	F	645	98	25-27-21, U	2+205, U	S	1D+41S, U	8(4-5)/8(4-5)	9(4)/9(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19752	M	568	121	26-27-21, U	1+190, U	S	1D+52S, U	8(4-5)/8(4-5)	NA/NA	1/1	1/1	0/0	2/2	1/1
RBINS 19796	M	527	110	23-27-21, U	3+188, U	S	1D+51S+1D+1S, U	8(4-5)/8(4-5)	9(3)/9(3)	1/1	2/1	0/0	2/2	1/1
RBINS 19808	F	307	42	26-29-21, U	2+206, U	S	1D+42S, U	9(4-6)/8(4-5)	8(3)/8(4)	1/1	1/1	0/0	2/2	1/1
RBINS 19809	M	236	46	23-27-21, U	3+186, U	S	1D+53S, U	8(4-5)/8(4-5)	7(3)/8(4)	1/1	1/1	0/0	2/2	1/1

Species / Specimen	Sex	SVL	TaL	DSR	PV+VEN	A	SC	SL	IL	Lor	PreO	SubO	PoO	AT
Bothrophthalmus lineatus														
B7	NA	996	≥204	23-23-21, K	200, U	S	≥71, D, U	NA	NA	NA	NA	NA	NA	NA
R 118	M	NA	NA	23-23-21, K	197, U	S	81, D, U	8(4-5)/8(4-5)	8(4)/8(4)	1/1	NA	0/0	2/2	NA
R 125	F	NA	NA	23-23-21, K	195, U	S	74, D, U	NA	NA	1/1	NA	0/0	2/2	NA
RBINS 19790	F	834	197	23-23-21, K	2+194, U	S	73, D, U	7(4-5)/7(4-5)	7(4)/7(4)	1/1	2/2	0/0	2/2	1/1
Limaformosa savorgnani														
B3	NA	596	64	15-15-15, K	223, K	S	56, D, K	NA	NA	NA	NA	NA	NA	NA
Mehelya poensis														
B5	NA	667	218	19-15-15, K	249, K	S	119, D, K	NA	NA	NA	NA	NA	NA	NA
B6	NA	855	220	19-15-15, K	249, K	S	99, D, K	NA	NA	NA	NA	NA	NA	NA
R 122	F	NA	NA	21-15-15, K	248, K	S	101, D, K	7(3-4)/7(3-4)	NA	1/1	1/1	0/0	2/1	2/2
R 371	F	NA	NA	17-15-15, K	244, K	S	93, D, K	7(3-4)/7(3-4)	7(4)/7(4)	1/1	1/1	0/0	2/2	1/1
R 373	M	NA	NA	17-15-15, K	244, K	S	93, D, K	7(3-4)/7(3-4)	7(4)/7(4)	1/1	1/1	0/0	2/2	1/1
R 374	F	NA	NA	19-15-15, K	250, K	S	98, D, K	7(3-4)/7(3-4)	8(5)/8(5)	1/1	1/1	0/0	2/2	1/1
R 506	M	NA	NA	17-15-15, K	242, K	S	106, K	7(3-4)/7(3-4)	8(5)/8(5)	1/1	1/1	0/0	2/2	1/1
Pythonidae														
Python sebae														
R 258	Juv.	683	91	64-84-44	273, U	S	65, U	13(0)/13(0)	21/21	NA	NA	NA	NA	NA
R 259	Juv.	594	84	67-86-51	270, U	S	66, U	15(0)/15(0)	21/21	NA	NA	NA	NA	NA
RBINS 19684	Juv.	571	86	67-90-50	0+270, U	S	3D+1S+3D+2S+ 54D+1S+1D, U	14(0)/14(0)	21(2)/21(2)	NA	NA	NA	NA	NA
Viperidae														
Atheris squamigera														
B1	NA	393	76	19-19-15, K	NA	S	58, S, U	NA	NA	NA	NA	NA	NA	NA
R 587	NA	NA	NA	25-20-15, K	157, U	S	55, S, U	11(0)/11(0)	12(2)/12(2)	NA	NA	NA	NA	NA
R 597	F	570	115	25-21-16, K	159, U	S	55, S, U	11(0)/11(0)	13(1)/13(1)	NA	NA	NA	NA	NA
R 598	F	NA	NA	26-22-16, K	160, U	S	52, S, U	10(0)/10(0)	12(2)/12(2)	NA	NA	NA	NA	NA
R 599	F	NA	NA	25-22-16, K	164, U	S	54, S, U	11(0)/11(0)	13(1)/13(1)	NA	NA	NA	NA	NA
Bitis gabonica														
B3	NA	310	28	33-38-30, K	NA	S	28, D, U	NA	NA	NA	NA	NA	NA	NA
R 368	NA	NA	NA	45-39-27, K	135, U	S	18, D	15(0)/15(0)	19(5)/19(5)	NA	NA	NA	NA	NA
R 606	NA	NA	NA	45-38-25, K	130, U	S	2D+8S+13D+3S, U	14(0)/15(0)	18(5)/18(5)	NA	NA	NA	NA	NA
RBINS 19802	F	665	43	38-42-32, K	2+133, U	S	3D+2S+16D, U	14(0)/14(0)	17(5)/17(5)	NA	NA	NA	NA	NA
Bitis nasicornis														
B4	NA	455	≥40	33-35-26, K	131, U	S	≥17, D, U	NA	NA	NA	NA	NA	NA	NA
R 242	M	NA	NA	31-36-26, K	123, U	S	28, D, U	17(0)/17(0)	18(5)/18(5)	NA	NA	NA	NA	NA
R 604	NA	NA	NA	40-43-27, K	132, U	S	20, D, U	18(0)/19(0)	18(5)/NA	NA	NA	NA	NA	NA
R 605	NA	NA	NA	38-41-24, K	131, U	S	20, D, U	17(0)/17(0)	19/19	NA	NA	NA	NA	NA
Causus lichtensteini														
B1	NA	370	30	15-15-11, K	147, U	NA	17, S, U	NA	NA	NA	NA	NA	NA	NA
R 89	F	NA	NA	15-15-11, K	144, U	S	17, S, U	6(0)/6(0)	9(4)/9(4)	1/1	2/2	2/2	2/2	2/2
R 123	M	NA	NA	15-15-11, K	137, U	S	18, S, U	6(0)/6(0)	9(4)/9(4)	1/1	2/2	2/2	2/2	2/2
R 622	M	NA	NA	15-15-11, K	136, U	S	19, S, U	6(0)/6(0)	9(4)/9(4)	1/1	2/3	2/2	2/2	2/2
R 623	F	NA	NA	15-15-11, K	142, U	S	17, S, U	6(0)/6(0)	9(4)/9(4)	1/1	NA	NA	NA	2/2
R 624	F	NA	NA	15-15-11, K	143, U	S	18, S, U	6(0)/6(0)	9(4)/9(4)	1/1	2/2	2/2	2/2	2/2
Causus maculatus														
B15	M	399	41	NA	133, U	NA	20, D, U	NA	NA	1/1	NA	NA	NA	2/2
B16	NA	125	10	17-19-12	158, U	NA	NA, D, U	NA	NA	1/1	2/2	NA	NA	2/2
B17	NA	127	12	19-18-12	152, U	NA	NA, D, U	NA	NA	1/1	2/2	NA	NA	2/2
R 116	F	NA	NA	19-19-12,	142, U	S	16, D, U	6(0)/6(0)	9(4)/9(4)	NA	2/2	NA	NA	2/2
R 119	F	NA	NA	19-19-12, K	143, U	S	16, D, U	6(0)/6(0)	9(4)/9(4)	NA	1/1	NA	NA	2/2
R 120	F	NA	NA	18-18-12, K	142, U	S	16, D, U	6(0)/6(0)	9(4)/9(4)	NA	2/2	NA	NA	2/2
R 127	F	NA	NA	19-19-12, K	140, U	S	14, D, U	6(0)/6(0)	9(4)/9(4)	NA	2/2	NA	NA	2/2
R 129	F	NA	NA	19-19-12, K	152, U	S	15, D, U	6(0)/6(0)	9(4)/9(4)	NA	2/2	NA	NA	2/2
R 136	M	NA	NA	19-19-12, K	130, U	S	10D+10S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 140	M	NA	NA	20-20-12, K	130, U	S	15D+3S, U	6(0)/6(0)	9(4)/9(4)	NA	2/2	NA	NA	2/2

Species / Specimen	Sex	SVL	TaL	DSR	PV+VEN	A	SC	SL	IL	Lor	PreO	SubO	PoO	AT
R 264	F	NA	NA	19-19-12, K	142, U	S	12D+6S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 266	F	NA	NA	20-18-12, K	141, U	S	15D+1S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 267	M	NA	NA	19-19-12, K	130, U	S	16D+4S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 269	F	NA	NA	19-19-12, K	141, U	S	14D+2S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 270	F	NA	NA	19-18-12, K	139, U	S	13D+3S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 388	M	NA	NA	20-19-13, K	132, U	S	16D+2S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 390	F	NA	NA	20-19-12, U	145, U	S	13D+4S, U	6(0)/6(0)	9(3)/9(3)	NA	2/2	NA	NA	2/2
R 391	M	NA	NA	21-19-12, K	135, U	S	17S+2D, U	6(0)/7(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 392	F	NA	NA	19-19-12, K	137, U	S	13D+2S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 393	F	NA	NA	18-18-12, K	142, U	S	15D+2S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 474	F	NA	NA	19-19-12, K	142, U	S	17, D, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 475	F	NA	NA	20-18-12, K	136, U	S	18, D, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 476	M	NA	NA	18-18-12, K	131, U	S	20, D, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 501	F	NA	NA	21-19-13, K	141, U	S	16, D, U	6(0)/6(0)	9(4)/10(4)	NA	2/2	NA	NA	2/2
R 502	M	NA	NA	19-18-12, K	131, U	S	10D+3S+6D, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 503	F	NA	NA	18-19-12, K	141, U	S	12, D, U	6(0)/6(0)	9(3)/9(3)	NA	2/2	NA	NA	2/2
R 618	M	NA	NA	18-19-12, K	129, U	S	2D+2S+8D+6S, U	6(0)/6(0)	10(4)/10(4)	NA	1/1	NA	NA	2/2
R 619	F	NA	NA	19-18-12, K	136, U	S	4S+6D+5S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
R 620	NA	NA	NA	19-19-12, K	130, U	S	4S+8D+7S, U	6(0)/6(0)	10(3)/10(3)	NA	½	NA	NA	2/2
R 621	NA	NA	NA	19-19-12, K	142, U	S	15D+2S, U	6(0)/6(0)	10(4)/10(4)	NA	2/2	NA	NA	2/2
RBINS 19587	F	496	37	19-19-12, K	3+138, U	S	15D+2S, U	6(0)/7(0)	9(4)/9(4)	2/1	2/2	1/1	2/2	2/2
RBINS 19588	F	606	47	19-19-12, K	3+140, U	S	1S+12D+3S, U	6(0)/6(0)	9(4)/9(4)	2/2	2/2	1/1	2/2	2/2
RBINS 19589	F	504	44	19-19-13, K	3+138, U	S	15D+2S, U	6(0)/6(0)	9(4)/9(4)	2/1	2/2	0/1	1/1	3/2
RBINS 19590	F	471	40	19-19-12, K	2+138, U	S	1S+1D+2S+7D+1S +3D+2S, U	6(0)/6(0)	9(4)/9(4)	2/2	2/2	1/2	0/2	3/2
RBINS 19591	M	461	41	18-19-13, K	3+126, U	S	17D+1S, U	6(0)/6(0)	9(4)/9(4)	2/1	2/2	0/0	1/2	2/2
RBINS 19592	M	506	50	19-19-12, K	3+128, U	S	17D+3S, U	6(0)/6(0)	9(4)/9(4)	2/2	3/3	1/1	2/2	2/2
RBINS 19702	M	459	42	20-19-12, K	3+129, U	S	16D+4S, U	6(0)/6(0)	9(4)/9(4)	3/3	3/3	0/0	1/2	3/2
RBINS 19737	M	380	36	20-19-12, K	3+126, U	S	13D+1S+1D+1S+ 1D+3S, U	6(0)/6(0)	9(4)/9(4)	1/1	2/2	1/1	2/2	2/2
RBINS 19738	F	439	39	19-19-12, K	0+137, U	S	2D+1S+3D+1S+ 2D+1S+2D+4S, U	6(0)/6(0)	9(4)/9(4)	2/2	2/2	1/1	2/3	2/2
RBINS 19753	M	475	49	18-18-12, K	3+128, U	S	2D+3S+11D+6S, U	6(0)/6(0)	9(4)/9(3)	1/1	2/2	0/1	2/2	2/2
RBINS 20030	FF	420	36	19-19-12, K	3+137, U	S	4D+2S+5D+6S, U	6(0)/6(0)	9(4)/9(4)	1/2	2/2	1/0	2/2	2/2
RBINS 20031	F	473	38	19-19-12, K	3+141, U	S	15D+2S, U	6(0)/6(0)	9(4)/9(4)	2/2	3/3	0/0	2/2	2/2

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Mexican Geographical Distribution Notes 2: New Distributional Records for Montane Crotalus (Serpentes: Viperidae) in the Golden Triangle Region of Chihuahua, Sinaloa, and Durango, Mexico

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Resumen

Ampliamos el rango de distribución conocido de *Crotalus willardi* en la porción central de la Sierra Madre Occidental en el occidente de México, y reportamos registros adicionales de *Crotalus pricei* de Sinaloa. Reportamos *Crotalus willardi* del estado de Sinaloa por la primera vez y damos registros adicionales para *C. pricei* del estado cual fue reportada anteriormente este año. Agregamos algunos registros adicionales para rellenar huecos grandes en su área de distribución conocida en esta región.

Palabras claves: Cascabeles, Distribución, *pricei*, Sierra Madre Occidental, *willardi*

Abstract

We extend the known range of the rattlesnake species *Crotalus willardi* in the central Sierra Madre Occidental mountains of western Mexico, and we report additional records of *Crotalus pricei* from Sinaloa. *Crotalus willardi* is reported from the state of Sinaloa for the first time, and *C. pricei* was reported earlier this year, and we independently confirm its existence in the state. We give further records which fill in some significant gaps in the known distribution of these two species in this region.

Keywords: Rattlesnakes, Distribution, *pricei*, Sierra Madre Occidental, *willardi*

Crotalus pricei Van Denburgh, 1895, has a distribution which ranges from southeastern Arizona along the Sierra Madre Occidental to northern Jalisco, where it has been reported from Arizona, Sonora, Chihuahua, Durango, Zacatecas (Lara-Gálvan et al., 2020) and Jalisco (Reyes-Velasco et al., 2012). It also occurs in the Sierra Madre Oriental from southeastern Coahuila through Nuevo León to southwestern Tamaulipas. *Crotalus pricei* is known to have two isolated populations in the central portion of Mexico, one in the Sierra Fría of Aguascalientes (Klauber, 1972) and another in the Real de Catorce complex in central San Luis Potosí (Reyes-Velasco et al., 2012). This species was recently reported from Sinaloa (Gamez-Duarte et al., 2023), where several authors have suggested that it may be found in the future. Despite some authors (Gamez-Duarte et al., 2023; Woolrich-Piña et al., 2016) alluding to its existence in Nayarit, to our knowledge this species has never been found in that state by those authors or anyone else.

Crotalus willardi Meek, 1906, has a distribution which stretches from southeastern Arizona and southwestern New Mexico south across the higher reaches of the Sierra Madre Occidental to west-central Zacatecas (see Campbell and Lamar [2004: p. 598] for a list of distribution references). It occurs in numerous outlier ranges in Sonora and Chihuahua, but appears to be restricted to the main portion of the sierra further south. The most recent lists of published localities for Chihuahua and Durango are in Lemos-Espinal and Smith (2007) and Lemos-Espinal et al. (2019), respectively. To our knowledge this species has not been reported from Sinaloa, Nayarit or Jalisco, despite several authors suggesting it may occur within those states.

Herein, we report on a several observations made between 2020 and 2022 in the central portion of the Sierra Madre Occidental. These observations were made in the general *Triangulo Dorado* (Golden Triangle) region where the states of Sinaloa, Chihuahua and Durango meet. Some were accidental observations made by MGB and ERA while searching for a presumably extinct woodpecker, *Campephilus imperialis* (Gould 1832), on high elevation plateaus. Others were found by RRC specifically while looking for unknown populations of *Crotalus*. We report *C. willardi* for the state of Sinaloa for the first time, and confirm the existence of *C. pricei* in the state as well. We also report several localities for both species which help fill significant gaps in the known distributions. The identities of all individuals were verified by Dr. Jacobo Reyes-Velasco.

New distributional records from Sinaloa for *Crotalus pricei*

Mexico: Sinaloa: Municipio de Badiraguato: rocky hillside on north side of class room, Escuela de Concentración Rural, Santa Getrudis (25.6828°N, -107.0201°W; WGS 84; 2507 m elev.), 03 August 2021. Marco A. González-Bernal and Edmi I. Rojas-

1. Biencom Real Estate, Carretera Chapala–Jocotepec #57-1, C.P. 45920, Ajijic, Jalisco, Mexico.
2. Biodiversa A.C., Avenida de la Ribera #203, C.P. 45900, Chapala, Jalisco, Mexico.
3. Herp.mx A.C., C.P. 28989, Villa de Álvarez, Colima, Mexico.
4. Facultad de Biología y Mineral de Nuestra Señora de la Candelaria, Universidad Autónoma de Sinaloa,C.P. 80780, Cosalá, Sinaloa, Mexico.
5. Universidad Autónoma de Occidente, Carretera Culiacán–Los Mochis #760 (km. 52.2), C.P. 81217, Ahome, Sinaloa, Mexico.

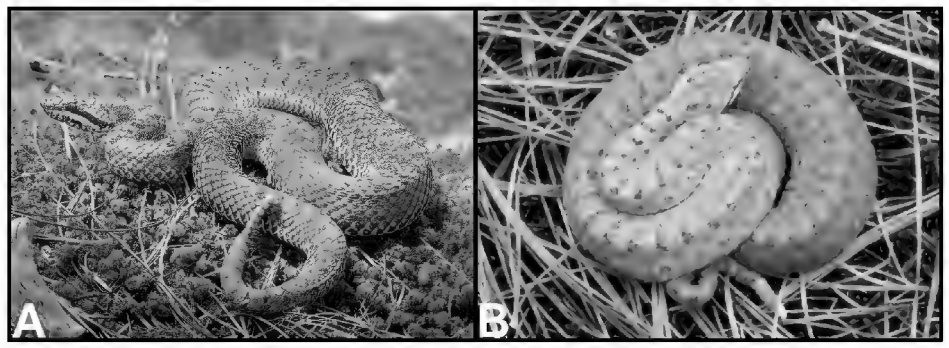

Figure 1. Photographs of *Crotalus pricei* from Sinaloa reported herein: **A**. Escuela de Concentración Rural, Santa Getrudis, Municipio de Badiraguato, Sinaloa; **B**. On road to Barranca del Cerro, approximately 6.3 km SSW of Santa Getrudis, Municipio de Badiraguato, Sinaloa. All photographs by Marco González-Bernal and Edmi Rojas-Aguilar.

Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9823). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525090. This snake was active amongst rocks in Pine Forest during the day. § On road to Barranca del Cerro, approximately 6.3 km SSW of Santa Getrudis, (25.6305°N, -107.0604°W; WGS 84; 2442 m elev.), 15 August 2021. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9820). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525089. This snake was active crossing the trail in Pine Forest during the day. These records confirm *Crotalus pricei* for the state of Sinaloa, and extend the known range approximately 40–45 km SSW from the closest locality at Guadalupe y Calvo, Municipio de Guadalupe y Calvo, Chihuahua (Lemos-Espinal and Smith, 2007; Gamez-Duarte, 2023).

New distributional records from Chihuahua, Durango and Sinaloa for *Crotalus willardi*

Mexico: Chihuahua: Municipio de Guadalupe y Calvo: 1 km SSE of "Los Parajes," on a trail to a poppy field (25.7°N, 106.951°W; WGS 84; 2147 m elev.), 15 October 2020. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. A photo voucher was deposited in the University of Texas Arlington, Digital Collection (UTADC 9826a,b). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525096. This snake was found alive crossing the trail during the day. § 1.3 km SW of Atascaderos, 13 August 2021. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9824). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525103. § 5.7 km SSW of Buenavista de Atascaderos on highway to La Tuna (25.72°N, 106.85°W; WGS 84; 2462 m elev.), 02 September 2022. Ricardo Ramírez-Chaparro and Sebastián Ochoa-Rodríguez. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9810). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164557132. This snake was found DOR during the day. § 3.2 km (airline) SSW of Baborigame (26.3984°N, 107.2672°W; WGS 84; 2045 m elev.), 19 September 2022. Ricardo Ramírez-Chaparro. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9811–9812). Records submitted to iNaturalist at: https://www.inaturalist.org/observations/164557133 and https://www.inaturalist.org/observations/164557134, respectively. Two

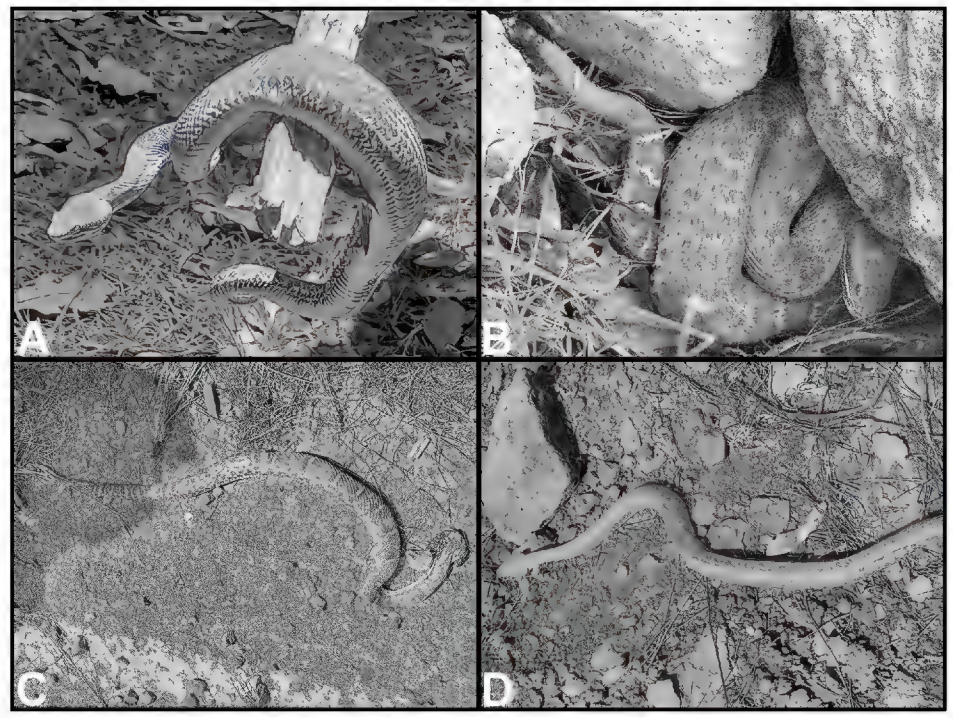

Figure 2. Photographs of *Crotalus willardi* from Chihuahua and Sinaloa reported herein: **A**. Mesa de la Palma, about 9.1 km (airline) NW of Santa Getrudis, Municipio de Badiraguato, Sinaloa; **B**. On a secondary trail between Santa Getrudis and "La Vibora," 8.9 km SE of Santa Getrudis, Municipio de Badiraguato, Sinaloa; **C**. 1.3 km SW of Atascaderos, Municipio de Guadalupe y Calvo, Chihuahua; **D**. In a poppy field between Santa Getrudis and "El Burro," Municipio de Badiraguato, Sinaloa. Photographs by Marco González-Bernal and Edmi Rojas-Aguilar.

snakes were found alive amongst bunchgrass on a rocky hillside during the day. Combined, these are the first records for the municipality, and extend the known range of this species approximately 123–192 km SE from the Cerocahui–Urique Road (Lemos-Espinal and Smith, 2007) and approximately 115–123 km NW from "24 km SW of Tepehuanes" (Reyes-Velasco et al., 2008); The Baborigame record helps fill a distributional gap of 200 km between the Cerocahui–Urique Road (Lemos-Espinal and Smith, 2007) and the Buenavista de Atascaderos records.

Mexico: Durango: Municipio de Tamazula: 5.5 km S of Osos Bravos on road to "El Durazno" (25.4033°N, 106.9239°W; WGS 84; 2020 m elev.), 14 August 2021. Marco. A. González-

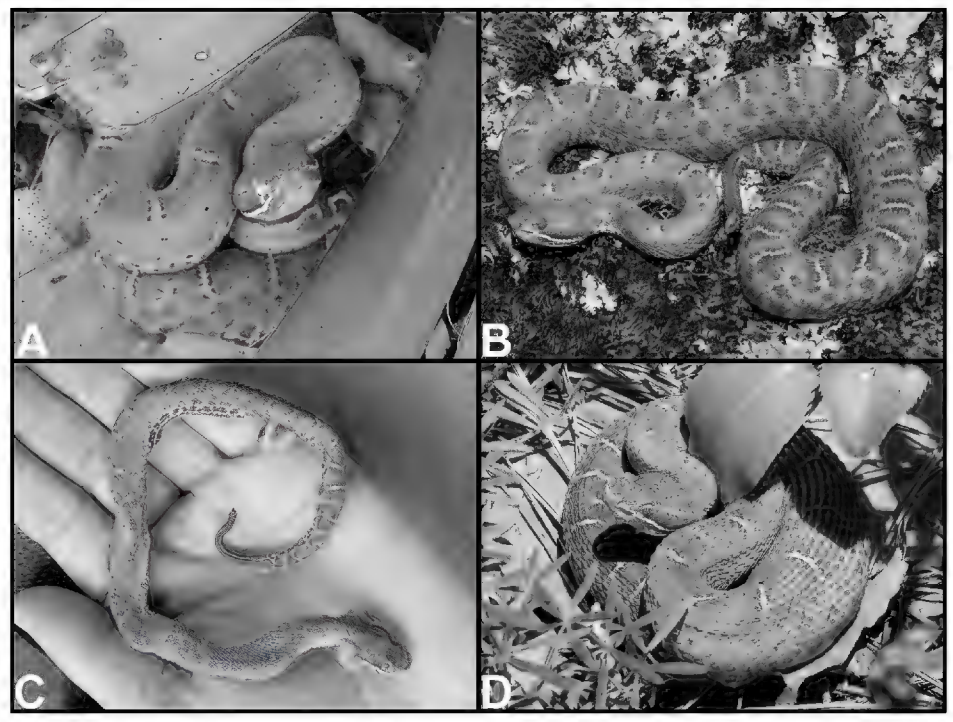

Figure 3. Photographs of *Crotalus willardi* from Chihuahua and Durango reported herein: **A**. 1 km SSE of "Los Parajes," Municipio de Guadalupe y Calvo, Chihuahua; **B**. 3.2 km (airline) SSW of Baborigame, Municipio de Guadalupe y Calvo, Chihuahua; **C**. 5.7 km SSW of Buenavista de Atascaderos on highway to La Tuna, Municipio de Guadalupe y Calvo, Chihuahua; **D**. 5.5 km S of Osos Bravos on road to "El Durazno," Municipio de Tamazula, Durango. Photographs: (A, D) by Marco González-Bernal and Edmi Rojas-Aguilar; (B, C) by Ricardo Ramírez-Chaparro.

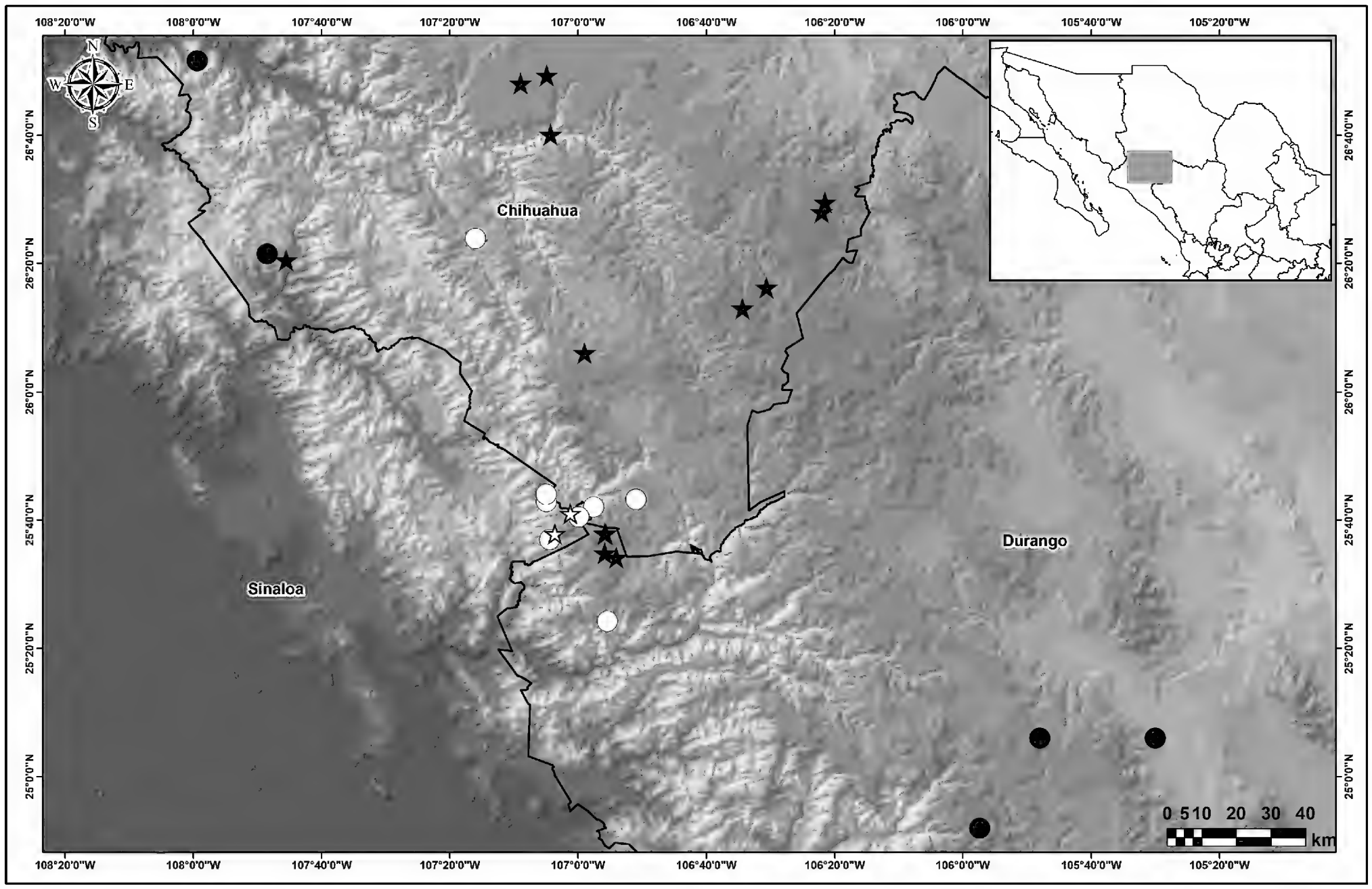

Figure 4. Map showing the Golden Triangle region of Chihuahua, Durango and Sinaloa. Circles represent records of *Crotalus willardi*; stars represent records of *Crotalus pricei*. Historical records are taken from GBIF (2022) and depicted by the solid black symbols. Records reported herein are shown by the white symbols.

Bernal and Edmi I. Rojas-Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9818a,b,c,d). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525086. This snake was alive on the side of the road during the day. This is the first record for the municipality, and extends the known range of this species in Durango approximately 110 km WNW from "24 km SW of Tepehuanes" (Reyes-Velasco et al., 2008).

Mexico: Sinaloa: Municipio de Badiraguato: In a poppy field between Santa Getrudis and "El Burro," approximately 1.8 airline km E of Santa Getrudis (25.675°N, 106.9981°W; WGS 84; 2648 m elev), 25 July 2021. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. A photo voucher of the individual was deposited in the University of Texas Arlington, Digital Collection (UTADC 9817). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525100. This snake was found alive during the day. This is the first record of this species for Sinaloa, and the first for the municipality, and extends the known range of the species 4.7 km WSW of the "Los Parajes," Chihuahua locality which is described above. § On a secondary trail between Santa Getrudis and "La Vibora," 8.9 km SE of Santa Getrudis. (25.6157°N, 107.0741°W; WGS 84; 2238 m elev), 24 August 2021. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9825). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525109. This snake was found alive during the day. § Mesa de la Palma, about 9.1 km (airline) NW of Santa Getrudis. (25.7335°N, 107.0834°W; WGS 84; 2319 m elev), 03 September 2021. Marco A. González-Bernal and Edmi I. Rojas-Aguilar. Photo voucher deposited in the University of Texas Arlington, Digital Collection (UTADC 9827). Record submitted to iNaturalist at: https://www.inaturalist.org/observations/164525111. This snake was found alive crawling through bunchgrass during the day. The habitat was a bunchgrass meadow amongst pine-oak woodland.

Acknowledgments

We thank Sebastian Ochoa-Rodríguez for help in the field. We are extremely grateful to guides Guillermo Macías-Vargas and Yodani Eduviel Orona-Ribota for their excellent help exploring the Sierra de Badiraguato. Furthermore, we thank Gregory Pandelis from the University of Texas Arlington for his lightning speed digital photo processing and for cataloguing the UTADC numbers. We are grateful to Eden Angeles for helping us create the map. We are indebted to Biencom Real Estate and Herp.mx for providing funding for some of the field work. Jacobo Reyes-Velasco helped with verifying identifications, and reviewing the manuscript.

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Mexican Geographical Distribution Notes 3: Second Record for the Elegant Coralsnake, *Micrurus elegans*, in the Chimalapas, Oaxaca, Mexico

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Introduction

The elegant coralsnake, *Micrurus elegans*, occurs in the Atlantic versant of Mexico and Guatemala, from Central Veracruz (Mexico) to Alta and Baja Verapaz (Guatemala). It is an attractive snake with distinctive coloration consisting of black and white triads, separated by orange bands. Two subspecies are recognized: *M. elegans elegans*, ranging from Central Veracruz southward to north-central Oaxaca, and *M. elegans veraepacis*, which occurs in SE Veracruz, south-central Tabasco, SE Oaxaca, and Chiapas, extending to the Atlantic Drainage of the foothills and mountains in Alta Verapaz, Guatemala. In Oaxaca, this species is known from the mountains of the Atlantic versant in the north-central part of the state, as well as from a single record from the Chimalapas, in the extreme SE part of the state, near the border with Veracruz (Soto-Huerta and Clause, 2017). Here, we report a second record for the Chimalapas region of Oaxaca.

Distribution record

Mexico: Oaxaca: Municipality of San Miguel Chimalapa: El Cordón del Reten, 55 km airline east of San Miguel Chimalapa. 16.6737°N, -94.2354°W, WGS84, 1810 m elev., 16 July 2021. Verified by Jonathan A. Campbell. The snake was not collected, but a photograph was deposited in the digital collection of the University of Texas at Arlington (UTADC 9859; see Figure 1). This observation was also shared via the iNaturalist platform as observation #115217717.

Discussion

This is the second record for the species in Los Chimalapas. The locality is approximately 48 km to the south of the previous record reported by Soto-Huerta and Clause (2017). This record represents the first sighting of the species in the Pacific versant of Mexico. The snake was found active around 1430 in the cloud forest. The pattern of the snake reported here includes 14 triads on the body, which is consistent with the pattern of the subspecies *M. elegans veraepacis* (Campbell and Lamar, 2004: p. 198).

Figure 1. *Micrurus elegans* from Los Chimalapas, Oaxaca. This represents the second record of the species in Los Chimalapas and the first record for the Pacific slope of Mexico

Acknowledgments

We thank Jonathan A. Campbell for verifying the identification of the snake reported here and Gregory Pandelis for depositing the photograph in the Digital Collection, University of Texas at Arlington. We also thank the Comisión Nacional de Áreas Naturales Protegidas (CONANP) for granting the facilities to carry out the sampling, as well as the community of Benito Juárez, San Miguel Chimalapa, Oaxaca.

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Herpetology 2023

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

TRAP ESCAPE BY SEMIAQUATIC SNAKES

E. J. Royal et al. [2023, Herpetologica 79(1):57-62] observe that sampling biases resulting from capture methodology or animal behavioral responses can significantly skew understanding of population size and structure. Behavioral responses to passive sampling with traps, such as trap-happy or trap-shy responses, can be accounted for in analyses using individual covariates but they require detailed understanding of the underlying behavioral mechanisms. The authors used a field experiment to investigate the impact of trap escape on capture rates and determine what traits influence trap escape rates between and within two species of semiaquatic snakes, *Liodytes pygaea* and *Nerodia fasciata*. They found that *L. pygaea* escaped significantly more often than did *N. fasciata*, smaller *L. pygaea* escaped at significantly higher rates than did larger conspecifics, and individual capture history significantly influenced escape rates in *N. fasciata*. These findings highlight understudied sources of inter- and intraspecific capture heterogeneity in a common sampling technique, and the authors urge researchers to consider method-specific sampling biases when attempting to produce population parameter estimates for species that are difficult to detect.

TEXAS HORNED LIZARD RANGE

J. W. Haney et al. [2022, Herpetologica 78(2):102-109] note that contraction in the geographic range of Texas horned lizards (*Phrynosoma cornutum*) has long been suspected but not definitively examined. Contraction of a species' geographic range occurs through extirpation of local populations and thus might often be an early warning sign of further endangerment of the species. As such, there is a need to identify species distributional databases and develop statistical procedures for testing for range contraction. The authors developed a method based on regression and data randomization and then applied the method to museum (VertNet) and citizen-science (iNaturalist) data compiled for Texas horned lizards spanning the time period 1960–2019. The regression analysis examined whether distances between observations and the range center had decreased or increased over time. Decreases in distances could indirectly indicate range contraction, whereas increases could indicate range expansion. Separate regressions were conducted for the four directional quadrants to assess the directionality of range change. Distance to VertNet observations in the eastern and western quadrants declined ($P < 0.05$) between 1960 and 2019, at rates of 4.4 and 1.5 km per year, respectively. The iNaturalist data (2000–2019) did not reveal significant declines in any of the quadrants. Further analyses indicated that these results were generally robust to the exact estimation (placement) of the historic range center. The analysis provides the first quantitative assessment and test of contraction in the range of *P. cornutum*. The method also demonstrates the utility of using museum and citizen-science data to monitor spatial distribution in other species that may be undergoing range contraction, although analyses must recognize inherent limitations of the data.

TOURISM VALUE OF CROCODILIANS

A. E, Rosenblatt et al. [2021, Herpetologica 77(4):289-293] not that wildlife tourism, including tourism involving large predators, is a rapidly growing industry that can generate many conservation and economic benefits. Monetary values can be derived for populations of large predators, and even individuals, on the basis of how much money tourists spend to see and interact with these awe-inspiring animals, but valuation studies only exist for a few groups of species. To help fill this gap the authors quantified the monetary value of crocodilians that are the focus of a wildlife tourism business in South America, the first time such a value has been calculated for crocodilians. They also compared the monetary values they derived with the monetary values of other crocodilians harvested in the hunting and farming industries during the same time period (2009–2014). They found mean minimum and maximum gross values of individual crocodilians per year as part of wildlife tourism were $422.00 USD and $566.67 USD, respectively, both higher than the mean gross value of individual crocodilians per year across hunting and farming industries ($300.29 USD). Individual crocodilians that were recaptured multiple times as part of wildlife tourism activities reached a peak value of $2700.00 USD. Thus, the study demonstrates that wildlife tourism can create substantial monetary incentives for local communities that coexist with crocodilians to work toward conservation goals. The authors conclude that wildlife tourism focused on crocodilians should be viewed as part of a larger strategy for conserving threatened populations, one that may include partners in the farming and hunting industries as well.)

EFFECTS OF EXPERIMENTALLY ELEVATED SOIL pH

D. A. Dimitrie et al. [2023, Ichthyology and Herpetology 111(1): 128-137] note that while the effects of acidification on certain aspects of forest ecosystems have been well studied, less is known about the influence of soil acidification on the forest floor food web that includes amphibians and invertebrates. The authors investigated the effects of acidification on the American toad (*Anaxyrus americanus*) and its interaction with the forest floor invertebrate community. They evaluated survival, growth, and diet of newly metamorphosed toads placed in terrestrial enclosures in forest plots with either experimentally elevated soil pH or untreated, acidified soils. They also conducted invertebrate pitfall sampling in these two soil pH types to evaluate the trophic interactions between toads and invertebrates. Toad mass after 90 days tended to be larger in plots with elevated soil pH, although survival and diet did not differ between soil pH types. The authors found no effect of soil pH on invertebrate abundances nor overall invertebrate diversity. They also found no evidence that toads exhibited top-down control of the invertebrate community. These results indicate that acidified soils did not affect forest floor trophic dynamics. The temporary enclosures, however, significantly reduced invertebrate abundances and overall diversity.

INFORMATION SIGNS AND INVASIVE SLIDERS

C. Schradin [2022, The Herpetological Bulletin 162:11-16] notes that invasive pond sliders, *Trachemys scripta*, have been released in thousands of fresh waters within Europe and reproduce in the southern states and even in warm areas of Germany. All member states of the European Union must have an action plan on how to fight this invasive species. The German action plan focuses on informing the public, but to date no study investigated the impact of such actions. NGOs setting up information signs report that this has not stopped the release of exotic pond turtles, but have provided no quantitative data to back this up. In 2019, an information sign was placed at the Althrein of Kehl, an oxbow lake where for the first time it had been shown that *T. scripta* is breeding in Germany. The author interviewed people walking along the oxbow lake before the sign was put up in 2019, and again in 2022. Counts of exotic pond turtles still increased, but this was mainly due to an increased number of small turtles, while the number of very large turtles did not increase. This suggests that the increase in peak counts might be rather due to local reproduction than additional release. After the information sign was set up, more people responded that the presence of exotic pond turtles is problematic for nature conservation and animal welfare, that it is illegal to release them, and that they should be removed. This response was especially strong in people who had read the information sign. Independent of the information sign, most interviewed people stated that one should not release pond turtles into the wild, but bring them to animal shelters. While the data here only represent one single case study, it is the first study showing that putting up information signs can be effective in changing the attitudes of people. This indicates that investment in informing the public is worthwhile, but also that at the same time evaluations of the impact of the measures are important. National action plans should focus on a combination of informing the public and removing the exotic pond turtles, but also on providing keepers of these animals the option to leave the animals at an animal shelter instead of releasing them into the wild.

Minutes of the CHS Board Meeting, May 16, 2023

A meeting of the CHS board of directors was called to order via Zoom at 7:32 P.M. Board members Kyle Houlihan, Margaret Ann Paauw and Jason Smith were absent. Minutes of the April 11 board meeting were read and accepted.

Officers' reports

Treasurer: Rich Crowley presented the April financial report.

Media secretary: Gabrielle Evans reported that the CHS has almost 1,000 followers on Instagram. There has been more engagement on Tumblr. Gaby will set up an instant chat feature for board members on Slack.

Membership secretary: Mike Dloogatch read through the list of recent nonrenewals. The CHS has not signed up any new members for the past several months.

Sergeant-at-arms: Tom Mikosz reported 20 in-person attendees at the April 16 meeting.

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Committee reports

Shows: Mike Dloogatch suggested that we check out pet-friendly bars. The Hoosier Herp Society has been having luck with this concept. At the invitation of the bar they bring their animals for an evening and get a percentage of the gross income and usually sign up new members. The public library in Chinatown has reached out to us to see if we can arrange a short presentation on reptiles.

Old business

International Herpetological Symposium: The 2023 IHS will take place July 25–28 at the Renaissance Schaumburg Convention Center Hotel in Schaumburg, Illinois. Information can be found at <https://www.iherpsymp.org/>

New business

John Archer announced that he is resigning as president; we will need to find a successor. He will not be leaving immediately and is willing to help the new president understand the position. John feels that we need a media-wise member to help lead us.

The meeting adjourned at 8:28 P.M.

Respectfully submitted by recording secretary Gail Oomens

Herpetological Art in the Columbian Park Zoo, Lafayette, Indiana — September 2, 2022

Photos and story by
Roger Carter
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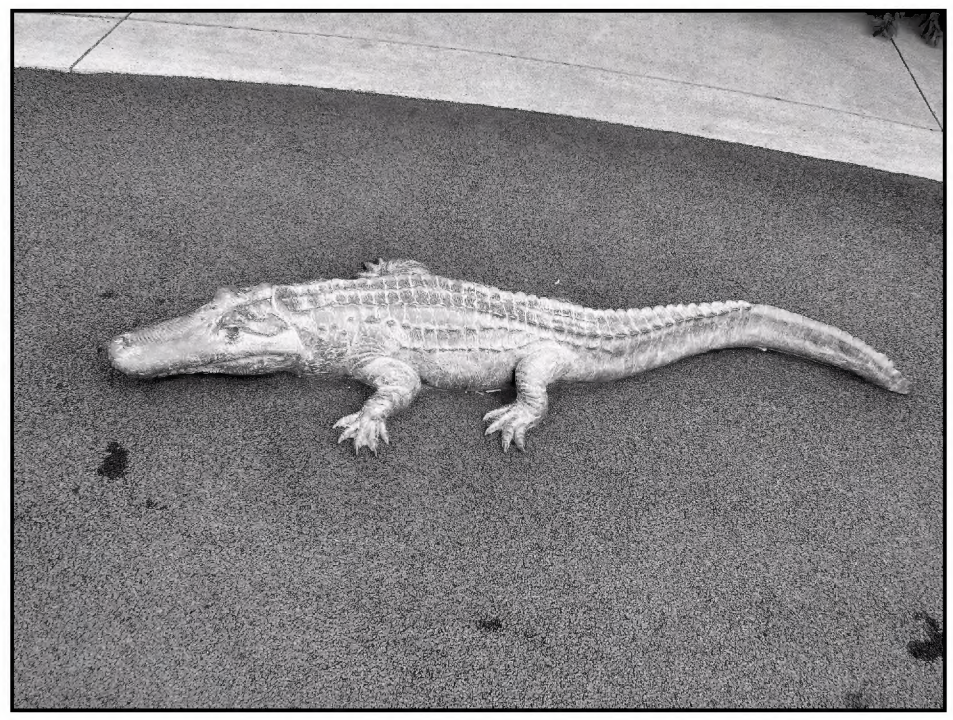
The Columbian Park Zoo is a small zoo. It took us only about an hour to get through the displays and the zoo doesn't have a herpetarium of any kind.

Just inside the front entrance is a splash park with water fountains for children to get wet and cool off on hot summer days. At this splash park is a bronze statue of an alligator that is four feet long; also bronze statues of a chimpanzee, a penguin and a bear with a fish in its mouth. At the time of our visit the splash fountains were shut off.

There is one live Galapagos tortoise, *Chelonoidis niger*, with the following description: "Habitat: Open grassy areas. Range: Galapagos islands. Size: Up to 4 feet across the shell; over 500 lbs. Diet: cactus, leaves, fruit. Lifespan: 150+ years." The exact subspecies here wasn't identified. Near the display of the live tortoise is a bronze statue of a Galapagos tortoise that is about the same size as the live tortoise and looks just like the live one. There is a bronze plaque that says "Rita Hadley Gentle ways, 2009. Bronze. A GIFT FROM: JAMES K. RISK FAMILY FOUNDATION. Columbian Park Zoo."

The live tortoise was the only herp that we saw.



UPCOMING MEETINGS

Monthly meetings of the Chicago Herpetological Society begin at 2:00 P.M. on the third Sunday of each month. Please try to join us online or *in person* at the Notebaert Nature Museum, 2430 N. Cannon Drive, Chicago. The next meeting will take place on June 18. This meeting will be the annual members' **Show & Tell**. All CHS members are encouraged to display one of their favorite animals either at the in-person meeting or via Zoom. Be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation. If you wish to present via Zoom, you must notify John Archer (jarcher@chicagoherp.org) beforehand.

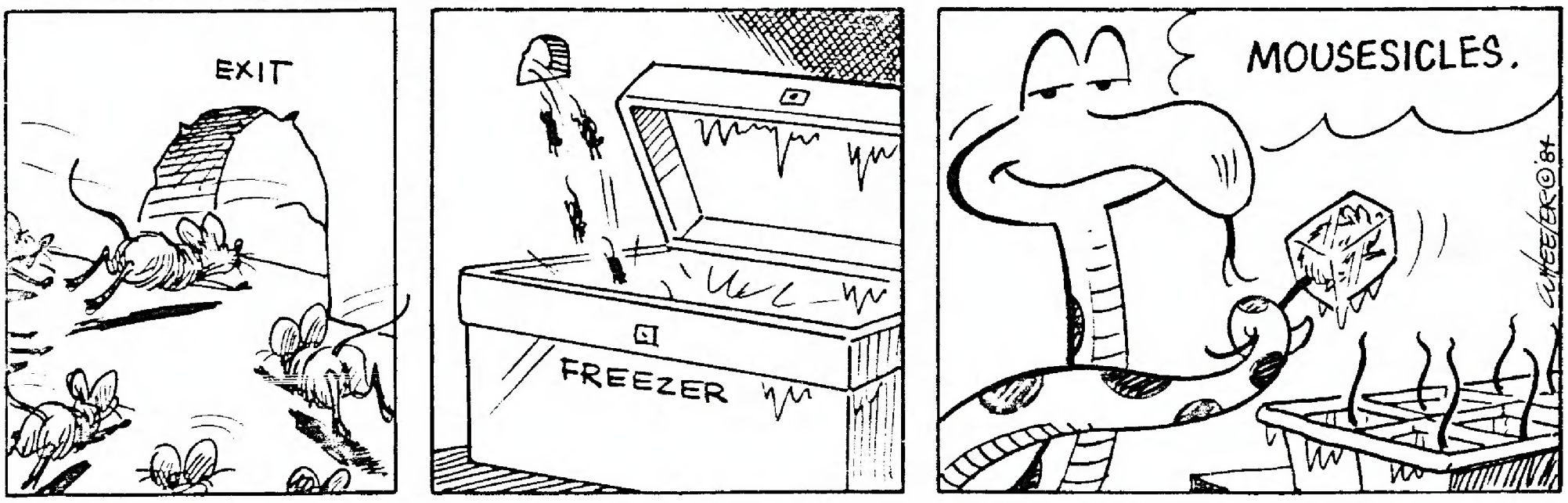
The program for the July 16 meeting has not yet been confirmed.

Please check the CHS website or Facebook page each month for information on the program. Information about attending a Zoom webinar can be found here:
<https://support.zoom.us/hc/en-us/articles/115004954946-Joining-and-participating-in-a-webinar-attendee->

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? The next board meeting will be held online. If you wish to take part, please email: jarcher@chicagoherp.org.

THE ADVENTURES OF SPOT



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